Woodbine Region

Well Control Contingency Plan

Halcón Resources

Prepared for: Halcón Resources

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Submitted by:

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Rapid Guide

Contents

Rapid Guide 1 – Emergency Well Control Contacts

The following is a list of emergency contact numbers to call in case of a well control event.

The most critical time in a well control event is in the first 24 to 72 hours.

Halcón Resources
Wellsite Emergency

+1.713.345.1060

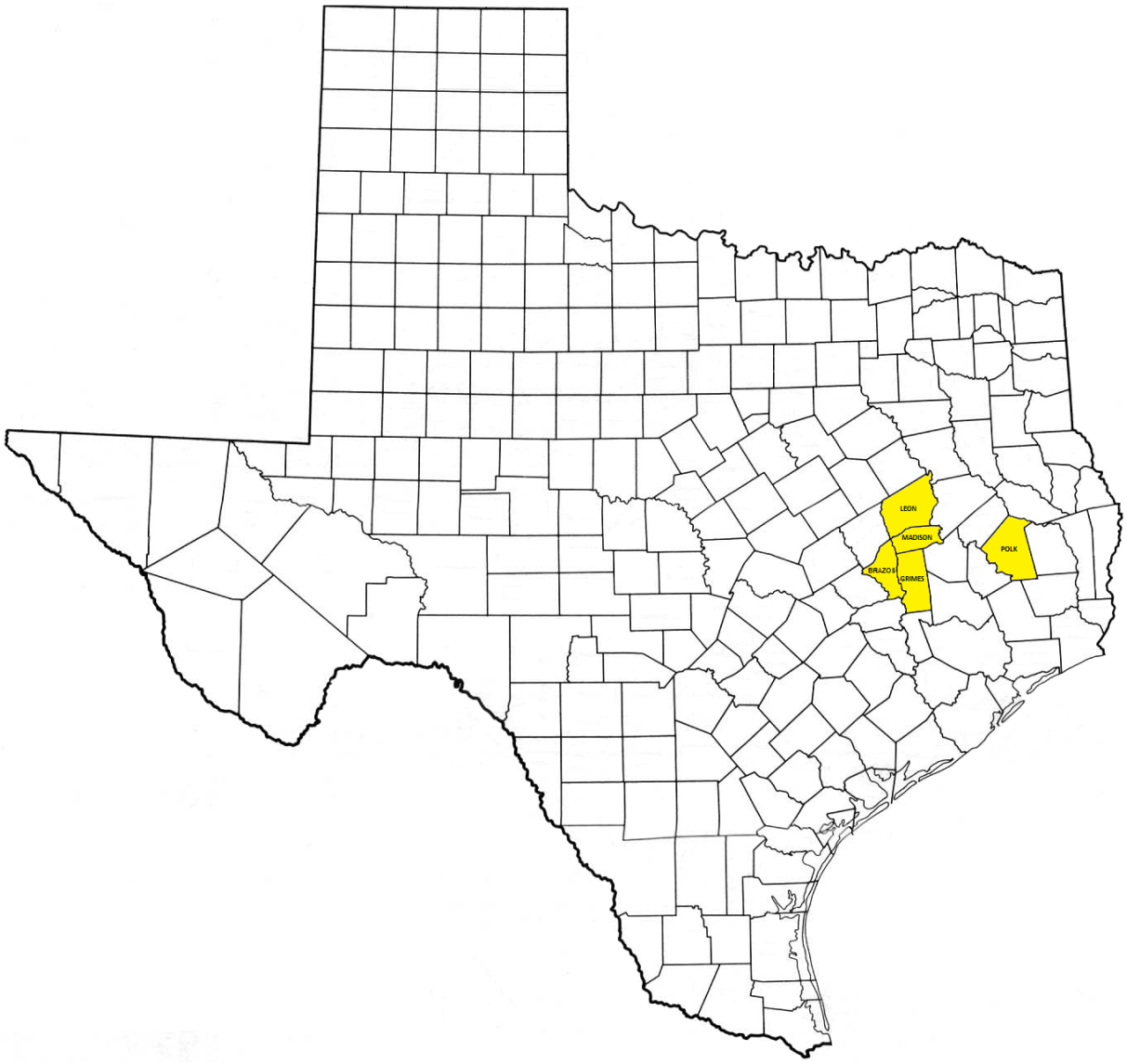
Boots & Coots Main Office
Houston, TX

24hr Service
+1.281.931.8884
+1.800.256.BLOWOUT

Physical Address
7908 N Sam Houston Pkwy W
Houston, Texas 77064
USA

Rapid Guide 2 – Woodbine Assets

The following is a Texas map of the counties wherein Halcón Resources Woodbine assets are located. This information needs to be reviewed and updated annually at a minimum.



Texas Counties

Rapid Guide 3 – Incident Classification

By definition a Well Control Contingency Plan (WCCP) is an 'after the fact' vital tool that would be used to mitigate a Level III incident. However, for information purposes, a brief description of Incident Classification is mentioned below.

Level I Incident: A Level I Incident is one which can be corrected at the field location or on site without supplemental outside support. The classification of an incident is often subjective in nature and should be reported to the Regional EHS Manager who will make the final decision as to classification. The objective is the prevention of escalation to a Level II Incident.

- Well Kicks
- Lost Circulation
- Environmental Release- 0 to 1 barrel (refer to ERP)
- Exceeding 80% of rated working pressure or safe working load rating on any equipment

Level II Incident: A Level II Incident is one that is beyond on site SOP and requires additional support. The objective is the prevention of escalation to a Level III Incident.

- Well Control Equipment Malfunction
- Large Volume Kick
- Drill Pipe or Casing- Approaching MASP
- Well Control Situation-Potential for Escalation
- Small Surface leaks that cannot be easily or safely isolated
- Environmental Release - greater than 1 barrel (refer to ERP)
- Presence of H_2S>10ppm

Level III Incident: This response is for well control incidents where control of the well has been lost. **The personnel and structure are potentially in *IMMINENT DANGER.*** Further escalation may include massive pollution, loss of life, serious structural damage or total loss of drilling/workover/production and wellhead due to explosion, fire or cratering. A Level III Incident (Blowout) is one requiring firefighting expertise and specialized contractors and equipment not found within the company. At this point the WCCP with its ICS is activated. The objective is the mitigation of harm to personnel, environment, assets, and company reputation. The objective is met by Command and Control as outlined in the ICS and Logistic Sections.

- Loss of Primary Well Control
  - Surface Blowout (Fire or No Fire)
  - Sustained Underground Blowout
  - Shearing Pipe
- Surface pressure beyond the pressure rating of equipment
- Other Situations that constitute a clear and present danger to personnel, environment or equipment that cannot be resolved via conventional means
- Hazardous Materials Spill
- Environmental Release - Refer to ERP

The only authorized person to reduce the level of an emergency shall be the Incident Commander.

Rapid Guide 4 – Internal Notification Process

The following are the incident response actions to be taken by Company personnel.

Action	Instructions
1	Notify your Supervisor and call Halcón Resources at **713.345.1060**
2	Upon notification the operator or EHS group will initiate The Instant Notification System (INS), a web-based application that can be accessed by designated users and is powered by Mir3, a third-party vendor. • The INS Administrator is responsible for continuous updates of the employee database and notification groups. • Requests to change an existing group or to set up a new group should be emailed to the **Attention of the EHS Director.**

Rapid Guide 5 – Field Response Team Contact List

The following is a list of the Halcón Resources that maybe contacted for a Level 3 well control event. This information needs to be reviewed and updated annually at a minimum.

Incident Commander (Drilling)	**Name:**	**Jason Houslander**	**24 Hour Emergency Numbe**r
	Title:	Drilling Superintendent	Cell:
	Office:	832.438.0536	
	Name:	**Chris Williams**	**24 Hour Emergency Numbe**r
	Title:	Drilling Superintendent	Cell:
	Office:	832.438.0536	
Incident Commander (Drilling Backup)	**Name:**	**Jonathan Foytlin**	**24 Hour Emergency Numbe**r
	Title:	Sr. Drilling Engineer	Cell: 713.302.7394
	Office:	832.538.0510	
Incident Commander (Completions)	**Name:**	**James Weatherby**	**24 Hour Emergency Numbe**r
	Title:	Completion Superintendent	Cell: 903.344.1144
	Office:		
Incident Commander (Production)	**Name:**	**Garry Gilbret**	**24 Hour Emergency Numbe**r
	Title:	Production Supervisor	Cell: 830.202.0047
	Office:	979.308.1683	Home: 325.651.7055
Incident Commander (Production Backup)	**Name:**	**Stacey Crook**	**24 Hour Emergency Numbe**r
	Title:	Production Supervisor	Cell: 979.308.1683
	Office:		
EHS	**Name:**	**Danny Harrell**	**24 Hour Emergency Numbe**r
	Title:	EHS Manager Woodbine	Cell: 225.571.1170
	Office:	713.652.4834	
Logistics	**Name:**	**Tammy Brown**	**24 Hour Emergency Numbe**r
	Title:	Production Clerk	Cell:
	Office:	903.344.1144 (1015)	
Logistics (Backup)	**Name:**	**Holly McCormick**	**24 Hour Emergency Numbe**r
	Title:	Administrative Assistant	Cell:
	Office:	903.344.1144 (1014)	

Rapid Guide 6 – Woodbine Management Contact List

Vice President, Woodbine Operations	**Name:**	**Nick Koch**	**24 Hour Emergency Number**
	Office:	832.538.0224	Cell: 918.231.0997
Manager, Drilling	**Name:**		**24 Hour Emergency Number**
	Office:		Cell:
Completions Engineer	**Name:**	**Lelan Anders**	**24 Hour Emergency Number**
	Office:	832.538.0592	Cell: 281.908.1752

Rapid Guide 7 – Governmental Agency Contacts

The following is a list of the Governmental Agencies that maybe contacted for a Level 3 well control event. This information needs to be reviewed and updated annually at a minimum.

Notification is required within 1-hour of an incident or when it is safe to make notifications.

Texas Railroad Commission Oil & Gas, Houston, TX	**Contact:**	**713.869.5001**	**24 Hour Emergency Number**
	Website:	www.rrc.state.tx.us/	**512.463.6788**
	Notify If:	Fire, leak, spill, loss over (5) barrels	
Texas Department of Environmental Quality	**Contact:**	**512.239.1000**	**24 Hour Emergency Number**
	Website:	www.tceq.texas.gov/	**800.457.0568**
	Notify If:	Fire, leak, or spill	
Texas Emergency Management	**Contact:**	**512.424.2000**	
	Website:	http://www.txdps.state.tx.us/dem/	
	Notify If:	Fire, leak, or spill	
National Response Center	**Contact:**		**24 Hour Emergency Number**
	Website:	www.nrc.uscg.mil/	**800.424.8802**
	Notify If:	Fire, leak, or spill	
U.S. EPA Region 6	**Contact:**	**214.665.2210**	**24 Hour Emergency Number**
	Website:	www.epa.gov/oem/	**888.372.7745**
	Notify If:	Fire, leak, or spill	
Federal Emergency Management Agency	**Contact:**		**24 Hour Emergency Number**
	Website:	www.fema.gov/	**800.621.3362**
	Notify If:	Fire, leak, or spill	
Occupational Safety & Health Administration Region 6	**Contact:**	**972.850.4145**	**24 Hour Emergency Number**
	Website:	www.osha.gov/	**800.321.6742**
	Notify If:	Within eight (8) hours after the death of any employee from a work-related incident or the in-patient hospitalization of three or more employees as a result of a work-related incident.	

U.S. Army Corps of Engineers	**Contact:**	**Fortworth District:** 817.886.1306
		Galveston District: 409.766.3004
	Website:	www.usace.army.mil/
	Notify If:	Fire, leak, or spill

Rapid Guide 8 – Level 3 Service Contacts

The following is a list of the local service personnel unique to the area that maybe contacted for a Level 3 well control event. This information needs to be reviewed and updated annually at a minimum.

Angel MedFlight Helicopter	**Name:**	**Air-Evac Lifeteam**	**24 Hour Emergency Number**
	Office:	480.559.6841	**877.264.3570**
MedFlight Air Ambulance	**Name:**	**Air Medical Team**	**24 Hour Emergency Number**
	Office:	406.225.8411	**800.325.1774**

Rapid Guide 9 – Local Emergency Agency Contacts

Brazos County

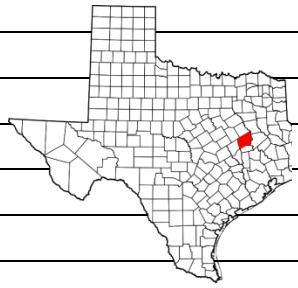
Name	Telephone
Precinct 3 Fire Department	(979) 776-0408
Precinct 4 Fire Department	(979) 846-6625
Bryan Fire Department	(979) 209-5970
Brazos County EMA	(979) 821-1010
Bryan Police Department	(979) 209-5300
Brazos County Sheriff	(979) 361-3888
St Joseph Regional Health Center	(979) 776-3777
St Joseph EMS	(979) 775-5911
St Anthony's Ambulance Services	(979) 779-1000

Grimes County

Name	Telephone
Navasota Fire Department	(936) 825-7388
Anderson Fire Department	(936) 837-2121
Plantersville Fire Department	(936) 894-9566
Grimes County EMA	(936) 873-4404
Navasota Police Department	(936) 825-6124
Grimes County Sheriff's Office	(936) 873-2151
Texas Highway Patrol (San Antonio)	(210) 531-2203
Grimes St. Joseph Health Center	(936) 825-6585
St. Joseph EMS / Ambulance	(888) 852-4911

Leon County

Name	Telephone
Centerville City Fire Department	(903) 536-2266
Hilltop Lakes Fire Department	(936) 855-2551
Buffalo City Fire Department	(903) 322-4292
Leon County EMA	(903) 536-4407
Texas Rangers	(903) 536-7076
Leon County Sheriff's Office	(903) 536-2749
Limestone Medical Center	(254) 729-3281
Comanche County Medical Center	(254) 879-2220
EMS	(903) 322-3444



Madison County

Name	Telephone
Hilltop Lakes Fire Department	(936) 855-2551
Normangee Fire Department	(936) 396-4017
North Zulch Fire Department	(936) 399-2495
Madison County EMA	(936) 348-3810
Madisonville Police	(936) 348-3317
Madisonville Sheriff	(936) 348-2755
Madison St. Joseph Hospital	(936) 348-2631
Guardian EMS	(936) 348-7777

Polk County

Name	Telephone
Corrigan Fire Department	(936) 398-2551
Alabama-Coushatta Fire Department	(936) 563-1100
Livingston Fire Department	(936) 327-4411
Polk County EMA	(936) 327-6826
Livingston Police Department	(936) 327-3117
Polk County Sheriff	(936) 327-6810
Memorial Medical Center	(936) 329-8700
Americare EMS	(936) 646-5449
Lone Star EMS	(936) 327-9024

Rapid Guide 10 – Emergency Third Party Service Vendors

Spill/Emergency Response/Equipment Contractors	**Company:**	Conestoga-Rovers & Assoc, Inc
	Location:	Houston, TX 77040
	Office:	(713) 734-3090
	Company:	Clean Harbors Environmental
	Location:	Houston, TX 77034
	Office:	(713) 750-5800 or (800) 645-8265
	Company:	Anderson Pollution Control, Inc
	Location:	Houston, TX 77017
	Office:	(713) 947-3800 or (866) 609-6208
	Company:	MSRC
	Location:	Houston, TX 77032
	Office:	(281) 776-4300 or (800) 645-7745
	Company:	NRC
	Location:	Houston, TX 77024
	Office:	(281) 606-4848 or (800) 899-4672
	Company:	Phoenix Pollution Control & Environmental Services Inc
	Location:	Baytown, TX 77520
	Office:	(281) 838-3400
	Company:	SLICK Response Services
	Location:	Deer Park, TX 77536
	Office:	(281) 713-9969 or (877) 35-SLICK
	Company:	Spill On Site Management Inc
	Location:	Humble, TX 77396
	Office:	(832) 644-9874 or (832) 554-5446
	Company:	USA Environment, LP
	Location:	Houston, TX 77287
	Office:	(713) 425-6900
Emergency Well Control Contractors	**Company:**	Boots & Coots Services
	Location:	7908 N. Sam Houston Parkway W., 5th Floor Houston, TX 77064
	Office:	(281) 931.8884 **24-hour** or (800) 256.9688 **24-hour**

Rapid Guide 11 – Third Party Service Contractors

Firefighting Equipment and Services	Boots & Coots	281-931-8884 **24-hour**
Specialty Well Control Equipment and Services	Boots & Coots	281-931-8884 **24-hour**
	Blowout Tools, Inc.	281-784-4730
	Great White/Archer	405-285-5812
	Halliburton	281-575-3000
	Hytorc	201-512-9500
	MYOCO	713-723-0110
	Cudd Pressure Control	832-295-5555
	Port-a-lathe	713-747-0090
	Wild Well Control	281-784-4700
	EXPRO	713-463-9776
	WELLCAT-Weatherford	1-800-WELLCAT
	Schlumberger-Camco	713-375-3494
Snubbing Equipment and Services	Boots & Coots	281-931-8884 **24-hour**
	ISS/ Superior Energy	281-784-4700
Directional Drilling Services	Halliburton-Sperry	281-871-4469
	Schlumberger	713-375-3494
	Baker Hughes INTEQ	713-439-8600
	Scientific Drilling Int'l	281-214-7600
	Gyro Data	281-213-6300
	Pathfinder	713-375-3494
Specialized Directional Drilling Equipment	Halliburton	281-871-4469
	Anadrill Schlumberger	713-375-3494
	Baker Hughes INTEQ	713-439-8600
	Weatherford	713-693-4000

Directional Surveying Services	Halliburton-Sperry	281-871-4469
	Schlumberger	713-375-3494
	Baker Hughes INTEQ	713-439-8600
	Scientific Drilling Int'l	281-443-3300
	Gyro Data	281-213-6300
	Pathfinder	713-375-3494
Electromagnetic Ranging Services	Scientific Drilling Int'l	281-443-3300
	Vector Magnetics	607-273-8351
Specialized Logging Equipment and Services	Baker Atlas	713-439-8600
	Halliburton Logging	281-575-3000
	Schlumberger	713-375-3494
	Weatherford	713-693-4000
High Pressure Pumping Services	Halliburton	281-575-3000
	Schlumberger	713-375-3494
	BJ Services	713-462-4239
	High Arctic	403-508-7836
Acidizing/Fracturing Services	Halliburton	281-575-3000
	Schlumberger	713-375-3494
	BJ Services	713-462-4239
Flexible High Pressure Hose Equipment	Technip Coflexip	33 (0) 1 47 78 24 00
	Weatherford	713-693-4000
Blowout Preventer (BOP) Equipment	Cameron	713-513-3300
	Hydril	713-635-5291
	NOV	713-375-3700
	WELLCAT-Weatherford	713-693-4000

Wellhead Equipment and Services	NOV	713-375-3700
	Cameron	713-513-3300
	Dril-Quip	713-939-7711
	FMC Energy Services	281-591-4000
	GE Oilfield Services	832-325-4200
Specialty Drilling Equipment	MI Swaco	713-375-3494
	Williams Tool-Weatherford	713-693-4000
Specialty Downhole Fishing Services	Boots & Coots	281-931-8884 **24-Hour**
	Baker Oil Tools	713-439-8600
	NOV	713-375-3700
	Schlumberger	713-375-3494
	Weatherford International	713-693-4000
	Logan Oil Tools	281-219-6613
Specialty Packers and Services	Baker Oil Tools	713-625-4200
	Halliburton	281-575-3000
	TIW	713-729-2110
	Weatherford	832-590-4000
Perforating Services	Halliburton	281-575-3000
	Schlumberger	281-285-1300
	Weatherford	713-693-4000
	Baker Hughes	713-625-4200
Specialty Demolition and Explosive Services	DuPont	302-774-1000
	Halliburton	281-575-3000
Specialty Drilling Fluids Systems Equipment	Derrick Equipment	281-590-3003
	Baroid-Halliburton	281-575-3000
	Schlumberger	281-285-1300
	Brandt-NOV	713-375-3700
	MI Swaco	713-375-3494

Specialty Fluids, Chemicals, and Additives	Baroid-Halliburton	281-575-3000
	Drilling Specialties	823-813-4100
	MI Swaco-Alpine	713-375-3494
	Schlumberger	281-285-1300
	Sun Drilling Products	504-393-2778
Mud Storage Equipment	Utilize Halcón Resources Preferred Vendor	
Seismic Services	Veritas DGC, Inc.	832-351-8300
	Western Geco-Schlumberger	281-285-1300
	Baker Atlas	713-439-8600
Specialized Computer and Software Services	Boots & Coots	281-931-8884 **24-Hour**
	Well Flow Dynamics/Ad Energy	47 66 98 32 90
Safety, Health, and Toxic Gas Detection Services and Equipment	Boots & Coots	281-931-8884 **24-Hour**
	HSE Integrated	403-266-1833
	Key Safety Services, Inc.	403-887-1111
Communication Equipment and Services	Able Communication	281-485-8800
	Motorola Communications	847-523-5000
Risk Assessment Specialist	Boots & Coots	281-931-8884 **24-Hour**

Contents Summary

Appendix A **Well Control Equipment and Services –** Includes information sheets which contain specific data regarding well control event mitigation and intervention for the Halcón Resources operations in the Woodbine region. The appendix also lists the equipment and service considerations for a well control event.

Appendix B **Well Control Data Sheet –** Contains forms to provide well information including location, well bore, casing string, BOP, and wellhead configuration to a well intervention team in case of a well control event.

Appendix C **Incident Assessment** – Provides a checklist for initial evaluation by a blowout control specialist, Halcón Resources and contractor personnel which determine the course of action that will result in well control being regained safely in a minimum amount of time.

Appendix D **Site Safety / Site Control** – Describes the importance of a Site Safety Plan and how to enforce it. This Appendix also defines the hazards to take into consideration when planning safe areas and hot zones.

Appendix E **Incident Response –** Details the initial planning and response guidelines to use during an emergency. This includes the Initial Response Cycle, Initial Planning Cycle, and the Daily Planning Cycle phases of a well control event.

Appendix F **Relief Well Considerations** – Lists the considerations to be used in the planning of a relief well. This appendix also summarizes the techniques and tools used for a relief well to intercept the target well and allow proper communication to safely mitigate a well control event.

Resources **Blowout Response Guide -** A WCCP guide of corporate, local, and third party contractor emergency contact numbers and checklists of roles and responsibilities of each tactical response team member.

Blowout Response Guide Quick Reference - A quick pocket reference guide of corporate, local, and third party contractor emergency contact numbers and checklists of roles and responsibilities of each tactical response team member. The quick reference guide is located at the back of the tally book.

Authorization for Issue

Issue Authority

Name: Nick Koch
Signature:
Date:
Position: Vice President of Operations

Technical Authority

Name: Bill Walker
Signature:
Date:
Position: Environmental, Health, and Safety Director

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Revision Record

Revision Number	Incorporated Date			For Audit Use Checked	
	Name	Signature	Date	Signature	Date
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Revision Summary

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A	07-Dec-13	Issued for Approval	EJC	RLS	JW	
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Distribution List

Ref #	Name	Title	Dept	Location	Signature
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TX-02					
TX-03					
TX-04					

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Preface

Purpose

This Issue of the Halcón Resources Well Control Contingency Plan is applicable to the Woodbine region in Texas and supersedes all previously issued Well Control Contingency Plans published by Halcón Resources.

The objective of the Halcón Resources Well Control Contingency Plan is to provide consistent guidelines and best practices that should be employed throughout Halcón Resources operations. The contents of this manual are based upon industry and Company procedures considered best in class. This manual provides essential guidance to all personnel involved in planning, execution or direct supervision of Halcón Resources drilling and well operations activities.

The contents of this document shall not be construed or interpreted as Halcón Resources policy.

While this manual identifies recommended practices, it must be recognized that governmental regulations or local considerations may require operations be carried out to a standard exceeding the specifications in this Well Control Contingency Plan.

This Well Control Contingency Plan is intended to be a living document, updated as technology is developed and operations procedures change. Feedback and recommendations for change are welcome and required from the user community to maintain this document as best in class. Users of the manual are invited to suggest improvements and identify errors following the procedures as outlined in the 'Management of Change'.

In addition to the uncontrolled hard copies, the master copy (and only controlled copy) of this document is available online via Halcón Resources intranet. Copies of the manual on CD-ROM will be available to facilitate electronic access to locations without reliable access to the internet. The online document is considered the master version and will contain the most up-to-date information. Each individual user is responsible for ensuring that they utilize the latest version of the document for reference.

The distribution of this document is managed by the Environmental, Health, and Safety (EHS) Group of Halcón Resources and controlled and administered in Houston, Texas.

Bill Walker

EHS Director

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Houston, Texas 77002

713-859-4240

BWalker@halconresources.com

Alternatively, contact Alex Christenson.

AChristenson@halconresources.com

Process for Change

Request for revisions or addition to this manual should be submitted electronically to Halcón Resources, this will be forwarded to the EHS Director and must include a brief supporting argument for the proposed revision or addition. Use of the enclosed Revision Proposal form is required when submitting recommendations for revision or addition. Halcón Resources staff will progress the proposed amendment and prepare appropriate revisions to the text of this manual. Significant revisions will then be peer reviewed for endorsement prior to issue by the Issue Authority. Upon approval, revisions or additions will be made to the Well Control Contingency Plan master file on the company intranet and hard copy versions. The user community will be notified electronically when changes are made to the Well Control Contingency Plan.

Revision Proposal	
From: Name:……	Date:……
Position:……	Tel: ……..

Details of Proposed Change/Revision

Document Title(s):

Unique Code(s):

Parts/Section(s):

Page(s) Affected:

Details:

(Attached marked up pages and/or associated drawings, etc as necessary.)

For us by Halcón Resources

☐Yes ☐ No ☐ Hold pending review

Technical Authority Signed: ……..

Position: ……

Date: ……..

Cost/Charge Code:

On completion, retain copy and send to either:

Bill Walker
EHS Director
1000 Louisiana, Ste. 6700
Houston, Texas 77002
713-859-4240
BWalker@halconresources.com

Alternatively, contact Alex Christenson.
AChristenson@halconresources.com

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List of Abbreviations

BCP	**Blowout Contingency Plan**
CEO	**Chief Executive Officer**
CMT	**Crisis Management Team**
CP	**Command Post**
DIC	**Deputy Incident Commander**
DPC	**Daily Planning Cycle**
EHS	**Environmental, Health, and Safety**
ERP	**Emergency Response Plan**
EOC	**Emergency Operations Center**
GOR	**Gas Oil Ratio**
HHP	**Hydraulic Horse Power**
HPHT	**High Pressure High Temperature**
HR	**Human Resources**
HSE	**Health, Safety and Environmental**
HQ	**Head Quarters**
IAP	**Initial Action Plan**
IC	**Incident Commander**
ICS	**Incident Command System**
IMT	**Incident Management Team**
IPC	**Initial Planning Cycle**
IRC	**Initial Response Cycle**

IT	**Information Technology**
LEL	**Lower Explosive Limit**
LFL	**Lower Flammability Limit**
MASP	**Maximum Allowable Surface Pressure**
MSDS	**Material Safety Data Sheet**
OSC	**On-Scene Commander**
PPE	**Personnel Protection Equipment**
ROV	**Remote Operated Vehicle**
SAR	**Search and Rescue**
SCBA	**Self Contained Breathing Apparatus**
SSO	**Site Safety Officer**
TCP	**Tactical Command Post**
TRT	**Tactical Response Team**
UEL	**Upper Explosive Limit**
UFL	**Upper Flammability Limit**
WCCP	**Well Control Contingency Plan**

Section 1 Response

Contents

1 Introduction

1.1 Overview of Well Control Contingency Plan

The most efficient responses to emergency situations are those for which plans are made prior to the development of the situation. Of similar importance, to the planning for such an event, is the communication of those plans. Preparation for an emergency response must therefore be documented sufficiently to allow communication of the plan to all concerned parties.

All of this preparation and communication is best managed by the Incident Command System (ICS). The required information and documentation provided for the Incident Command System (ICS), should define how the response will initiate, notification responsibilities, response team structure and staffing, project work flows, and individual responsibilities. The Incident Command System consists of three (3) organizations or teams, and these teams are designed to handle the planning and the response to a well control and blowout incident specific to the Halcón Resources wells in the Woodbine region. The teams are defined as:

- Tactical Response Team (TRT)
- Incident Management Team (IMT)
- Crisis Management Team (CMT)

In more basic terms it is common to refer to these teams as the On-Scene Team, Offsite Team and the Corporate Team.

The end goal of the Well Control Contingency Plan (WCCP) is to create a work guide to ensure, in the event of an emergency well control incident, an organized response for blowout control is brought swiftly and efficiently into action, and to demonstrate command and control of the incident.

The WCCP should provide, as a minimum, a working methodology to safely and effectively manage the operations necessary to regain control of a well blowout considering local conditions. This would include the initial response, covering the period after evacuation until dedicated control teams are formed and blowout control specialists have arrived on location, and

managing the control operations thereafter until recovery of well control is complete. The WCCP sub-goals are to provide local guidance for:

- Safeguarding human life. When primary well control is lost it is essential to control site safety, safety of third parties within a defined exclusion zone, and the safety of those directly involved with the well control operations.
- Activating an organization to demonstrate 'Command and Control' of the incident response in the eyes of the public, personnel, stakeholders, insurance underwriters and contractors.
- Initiating actions which will mitigate blowout escalation to minimize damage to the environment, assets, company reputation and demonstrate business continuity.
- Understanding the exposure to potential blowout control problems unique to your local operating environments to minimize lost time discovering them during an actual emergency.
- Well Control Contingency Plan drills must be conducted and lessons learned evaluated for incorporation into the WCCP.
- Communicating to the local populace, neighbors and emergency management to provide safety information.
- Internal and external communication to aide response efficiency, protect lives, health, property and the environment, and protect the Company's reputation through internal and external understanding of the event and response activities.

1.2 Purpose of the Well Control Contingency Plan (WCCP)

The primary objective of the Well Control Contingency Plan (WCCP) is to provide concise guidelines, compatible with Halcón Resources tiered emergency response system, to specifically assist the Tactical Response Team (TRT) to manage the various operations required for regaining control of a well blowout. More specifically:

- Define the local Tactical Response Team (TRT) functional organization with its position in the overall Incident Command System (ICS).
    - The organization shall be structured for command and control. The Incident Command System (ICS) is the industry/internationally recognized model for Halcón Resources.
    - It shall be designed to expand and contract depending on the circumstances of the incident. A functional organization defines roles and responsibilities and it is not

necessary for a different person to fill all functional roles; e.g., if the incident is small, one person may take responsibility for several functional positions in the ICS organization.
    - Define reporting structure and communication procedures.
    - Define responsibilities and guidelines for ICS functional positions.
- Define initial response (after evacuation) and blowout control project planning guidelines for the ICS leaders both on-scene and off-scene. This objective maps the typical steps 'Best Industry Practice' followed in initial response and regaining control of a well blowout.
- Define task guidelines for each of the key Incident Command System (ICS) functional positions. This objective is primarily for Halcón Resources employees and contractors who hold functional positions in the ICS. It is not necessary to define how blowout control specialists perform their jobs (e.g., details on capping techniques) other than for information purposes.
- Define daily project execution guidelines for blowout control operations to demonstrate command and control. This should include ICS meeting schedules, typical agendas and written work instructions for the next operational period.
- For site specific WCCP's, Halcón Resources personnel should pre-define basic problems which may make regaining control of a blowout in operating areas unusually difficult with plausible solutions.
    - This information would come from high level risk/hazard assessments with respect to blowout control and recovery. This might include issues such as logistics, security, weather and environment, limited personnel, high potential blowout flow rates, HPHT, H_2S, kill equipment requirements (HHP and flow rate), mud requirements, availability of fire water, pollution control, proximity to 3^{rd} parties, surface and subsurface constraints and hazards for relief well, spare casing and wellheads, capping issues, etc.
    - This data would be kept in appendices and used by the ICS in the initial planning phase.

1.3 Scope of the Well Control Contingency Plan (WCCP)

The Well Control Contingency Plan (WCCP) shall cover the activities to be carried out to assess the well control incident and to plan and execute appropriate response measures to ultimately regain control of the blowout through the wellhead. Pipeline and other fires are not within the scope of this WCCP. The WCCP should take in account the specific operational environment and the local context of the particular operating area.

The WCCP shall be an integral part of the overall 'Emergency Response Plan'. Therefore, it shall refer as necessary to the relevant emergency procedures and contingency plans already included in the overall 'Emergency Response Plan'.

The following items are typically covered in the overall 'Emergency Response Plan' and therefore are not in the scope of the WCCP:

- The security problems and political issues.
- The communication procedure with the local authorities, the partners, families, media.
- The consequences of the blowout (medical, medivac, pollution control, etc.).
- The emergency procedures for contracting, administration, procurement, etc.

1.4 Well Control Contingency Plan (WCCP) Relationship with the Halcón Resources ERP

The Well Control Contingency Plan (WCCP) must coincide and be compatible with the Halcón Resources Emergency Response Plan (ERP). The WCCP shall be considered as an integral part of the document.

It is critical that the Incident Command team assemble, at a minimum, on an annual basis to conduct periodic drills on response to emergency scenarios. Scenarios should progress from Level I to Level III (blowout stage) to ensure that all Incident Command section leaders are provided an opportunity to participate. In addition, to serving as a periodic refresher, the drills can be utilized to implement 'Management of Change' including revised policies and procedures as well as provide the opportunity to verify the contact information for critical personnel, contractors and vendors.

1.5 Reference Documents

Emergency Response Plan – In development

Spill Response Plan – Part of the ERP in development

Medical Response Plan – Part of the ERP in development

Fatality/Major Injury Plan – Part of the ERP in development

Crisis Communication Plan – In development

2 Notification and Initial Action

2.1 Incident Classification

By definition a Well Control Contingency Plan (WCCP) is an 'after the fact' vital tool that would be used to mitigate a Level III incident. However, for information purposes, a brief description of Incident Classification is mentioned below.

Level I Incident: A Level I Incident is one which can be corrected at the field location or on site without supplemental outside support. The classification of an incident is often subjective in nature and should be reported to the Regional EHS Manager who will make the final decision as to classification. The objective is the prevention of escalation to a Level II Incident.

- Well Kicks
- Lost Circulation
- Environmental Release- 0 to 1 barrel (refer to ERP)
- Exceeding 80% of rated working pressure or safe working load rating on any equipment

Level II Incident: A Level II Incident is one that is beyond on site SOP and requires additional support. The objective is the prevention of escalation to a Level III Incident.

- Well Control Equipment Malfunction
- Large Volume Kick
- Drill Pipe or Casing- Approaching MASP
- Well Control Situation-Potential for Escalation
- Small Surface leaks that cannot be easily or safely isolated
- Environmental Release - greater than 1 barrel (refer to ERP)
- Presence of H_2S>10ppm

Level III Incident: This response is for well control incidents where control of the well has been lost. **The personnel and structure are potentially in *IMMINENT DANGER.*** Further escalation may include massive pollution, loss of life, serious structural damage or total loss of drilling/workover/production and wellhead due to explosion, fire or cratering. A Level III Incident (Blowout) is one requiring firefighting expertise and specialized contractors and equipment not found within the company. At this point the WCCP with its ICS is activated. The objective is the mitigation of harm to personnel, environment, assets, and company reputation. The objective is met by Command and Control as outlined in the ICS and Logistic Sections.

- Loss of Primary Well Control
  - Surface Blowout (Fire or No Fire)
  - Sustained Underground Blowout
  - Shearing Pipe
- Surface pressure beyond the pressure rating of equipment
- Other Situations that constitute a clear and present danger to personnel, environment or equipment that cannot be resolved via conventional means
- Hazardous Materials Spill
- Environmental Release - Refer to ERP

The only authorized person to reduce the level of an emergency shall be the Incident Commander.

2.2 Initial Emergency Procedures

Halcón Resources Incident Command System (ICS) is composed of three major parts as follows:

1. On-Scene Responders-Tactical Response Team (TRT)
2. Incident Management Team (IMT)
3. Crisis Management Team (CMT)

Each of the three parts of the system will be described in detail later within the Well Control Contingency Plan (WCCP). This section is provided as a quick reference to guide immediate responses to an emergency.

IN THE EVENT OF A WELL CONTROL EMERGENCY, ONSITE PERSONNEL SHOULD RESPOND ACCORDING TO THE INFORMATION PROVIDED IN THE FOLLOWING SECTIONS.

2.3 On-Scene Response

On-Scene responders will initially involve only the personnel present at the site when an emergency is detected. The On-Scene Commander Wellsite Supervisor/Production Superintendent will be responsible for Search and Rescue (SAR) and evacuation. The ranking Halcón Resources employee on site Wellsite Supervisor/Production Superintendent will then assume the role of On-Scene Commander. (Reference organization chart)

The initial objectives of the On-Scene responders are to:

1. Provide for the health and safety of personnel
2. Collect the necessary data
3. Notify the appropriate management of the incident
4. Notify Communications Director of the incident

2.3.1 Health and Safety

The first responsibility of the On-Scene Commander will be to ensure the safety of all other personnel onsite. Actions taken to protect health and safety will depend on the specific nature of the emergency.

2.3.2 Data Collection

Notification to upper management of a well control incident must include sufficient data for an assessment to be made about the severity of the incident. Prior to such notification, the On-Scene Commander must either collect data himself or delegate the collection of data to one or more other individuals.

The data identified in the Well Control Worksheet in Appendix B should be collected prior to notification to well control contractor.

2.4 Notifications

The Wellsite Supervisor/Production Superintendent (On-Scene Commander **after** SAR, Evacuation, Medivac) will contact the Regional EHS Manager to provide notification that a well control event has occurred. Regional EHS Manager is responsible for notifying the **Incident Commander** (Vice President of Operations).

The backups shown in the Rapid Guide should only be used in the unlikely event that the Wellsite Supervisor/Production Superintendent cannot be immediately contacted. Backups should be called in the order shown.

Following those notifications, if not already onsite, EHS personnel should be dispatched to site to ensure that existing Halcón Resources safety policies and contingency plans are implemented.

The **Incident Commander** is responsible for making the notifications necessary to activate the Incident Command System (ICS). The Rapid Guide contains Halcón Resources contact positions and their numbers to be used for such notifications. **Email is never used as the primary notification procedure.**

The **Incident Commander** will notify well control contractor (Boots & Coots by calling +1 (281) 931-8884 in Houston, which is the 24-hour access number for Blowout Response. Additional well control assistance can be obtained via email at engineering@boots-coots.com).

The **Incident Commander** will then begin notifying members of the Tactical Response Team (TRT) and preparing to mobilize the team to site. The **Incident Commander** will determine which of these individuals is contacted and mobilized. The TRT will report to the site of the event or as directed by the **Incident Commander**.

2.5 State and Federal Notifications

Notification required within 1-hour of incident or when safe to make notifications.

Texas Emergency Management

Notification Number	512-424-2000

County Emergency Management

Brazos County	979-821-1010
Grimes County	936-873-4404
Madison County	936-348-3810
Leon County	903-536-4407
Polk County	936-327-6826

2.6 Evacuation Procedures

Follow drilling contractor evacuation procedures. Refer to the Site Safety Plan.

2.7 Equipment to be 'Fast Tracked' to Location

- (Boots & Coots) Fire Fighting Package
- Spill Control Equipment

2.8 Notification Protocol

Following are the incident response actions to be taken by Company personnel.

Notification is required within 1-hour of an incident or when it is safe to make notifications.

Action	Instructions
1	Notify your Supervisor and call Halcón Resources at **713.345.1060**
2	Upon notification the operator or EHS group will initiate The Instant Notification System (INS), a web-based application that can be accessed by designated users and is powered by Mir3, a third-party vendor. • The INS Administrator is responsible for continuous updates of the employee database and notification groups. • Requests to change an existing group or to set up a new group should be emailed to the **Attention of the EHS Director.**

A complete list of contacts can be found in the Rapid Guide.

Section 2 Incident Command System

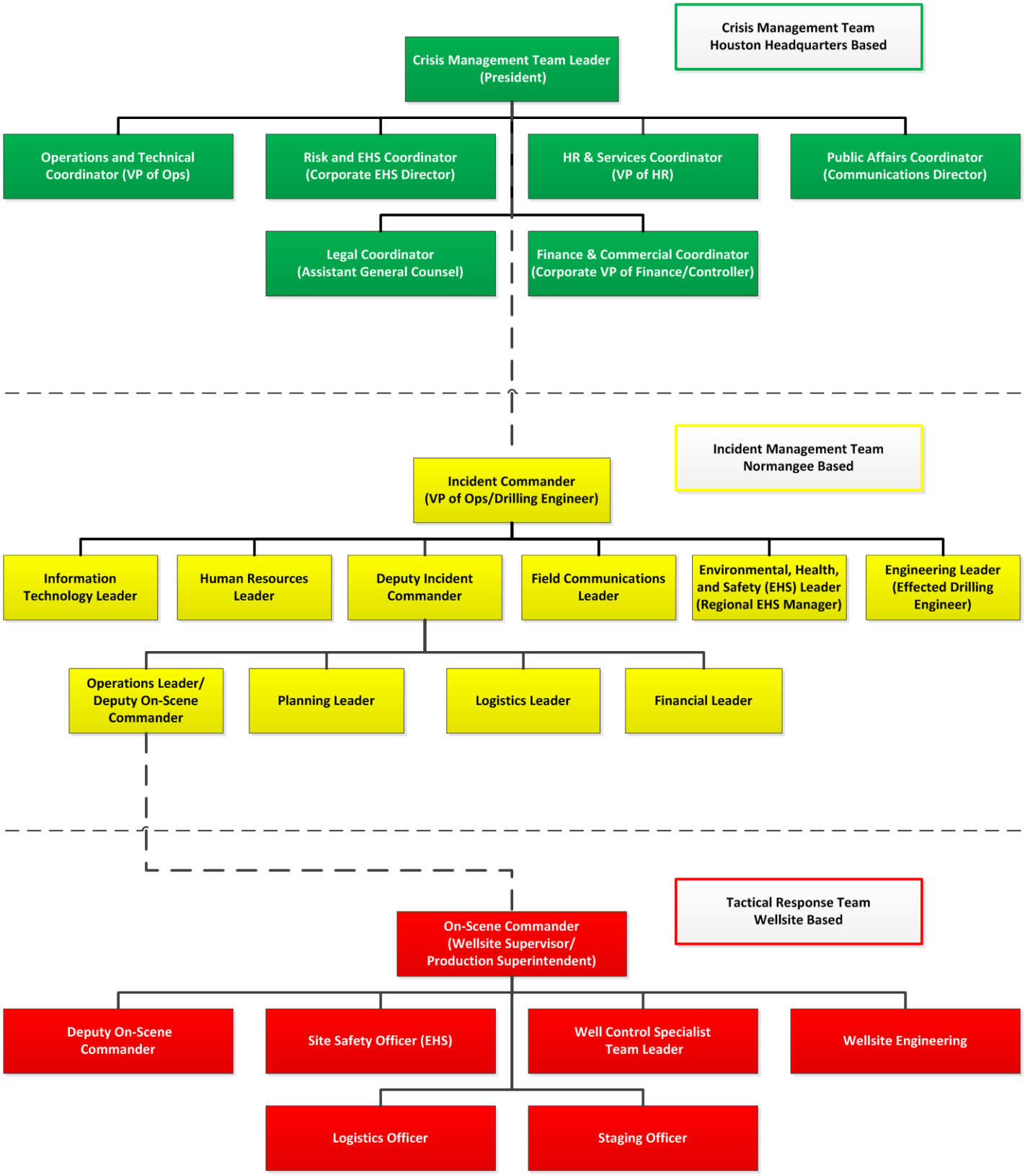
Contents

1 Introduction

The roles, responsibilities and checklists of the Incident Command System (ICS) team members are presented in this section. These are basic guidelines that should be considered and used by the team members to help organize and avoid chaos during a Halcón Resources incident. There are three (3) teams involved, these being the Tactical Response Team (TRT) (Wellsite based), the Incident Management Team (IMT) (Normangee, TX based) at the Emergency Operations Center where the office is located, and if required, a Halcón Resources Crisis Management Team (CMT)(Houston, TX based).

The On-Scene Command Post imperatively will need full scale communications equipment and desk top space for the appropriate work and tasks to be performed. Daily meetings will be held after each working tour to summarize relevant advances to the remedial effort and report these to the Incident Management Team (IMT) members who will be working from an Off-Scene Command Post known as the Emergency Operations Center (EOC) Conference Room. This Emergency Operations Center for Halcón Resources will be located at 24523 OSR Normangee, Texas 77871. An ICS organizational chart is provided in this section followed by the responsibilities of all the ICS team members.

It is critical that the Incident Command System team members assemble, at a minimum, on an annual basis to conduct periodic drills on response to emergency scenarios. Scenarios should progress from Level I to Level III (blowout stage), as mentioned in Section 1, to ensure that all Incident Command section leaders are provided an opportunity to participate. In addition, to serving as a periodic refresher, the drills can be utilized to implement 'Management of Change' including revised policies and procedures as well as provide the opportunity to verify the contact information for critical personnel, contractors and vendors.

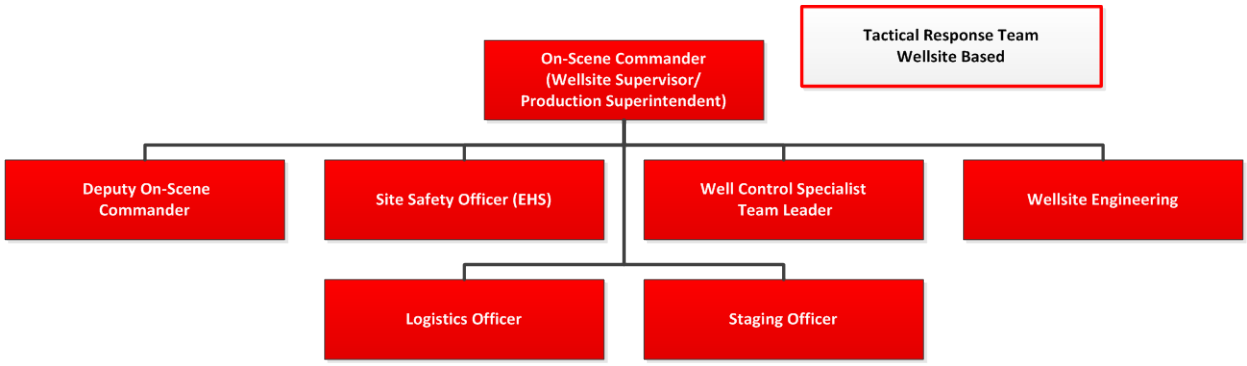

Crisis Management Team
Houston Headquarters Based
Crisis Management Team Leader (President)
Operations and Technical Coordinator (VP of Ops)
Risk and EHS Coordinator (Corporate EHS Director)
HR & Services Coordinator (VP of HR)
Public Affairs Coordinator (Communications Director)
Legal Coordinator (Assistant General Counsel)
Finance & Commercial Coordinator (Corporate VP of Finance/Controller)
Incident Management Team
Normangee Based
Incident Commander (VP of Ops/Drilling Engineer)
Information Technology Leader
Human Resources Leader
Deputy Incident Commander
Field Communications Leader
Environmental, Health, and Safety (EHS) Leader (Regional EHS Manager)
Engineering Leader (Effected Drilling Engineer)
Operations Leader/ Deputy On-Scene Commander
Planning Leader
Logistics Leader
Financial Leader
Tactical Response Team
Wellsite Based
On-Scene Commander (Wellsite Supervisor/ Production Superintendent)
Deputy On-Scene Commander
Site Safety Officer (EHS)
Well Control Specialist Team Leader
Wellsite Engineering
Logistics Officer
Staging Officer

2 On-Scene Tactical Response Team (TRT)

2.1 Tactical Response Team (TRT)

On-Scene response members will make up the Tactical Response Team (TRT) and will operate from the On-Scene Command Post. The communications with the Incident Management Team (IMT) is vital and necessary for this post to function. Specialist and key Halcón Resources team players may be required and used to relieve, if necessary, the members of the Tactical Response Team (TRT). This is especially normal if the operations to remediate the incident will require many days, weeks or months. The **On-Scene Commander** will be in charge of the TRT, the purpose of the TRT is to use all efforts and resources available to control and correct the incident on hand. Tactical Response Team (TRT) members for Halcón Resources typically include the following:

- On-Scene Commander
- Well Control Specialist Team Leader
- Logistics Coordinator
- Site Safety Officer (EHS)
- Deputy On-Scene Commander
- Wellsite Engineering
- Staging Coordinator



Depending on the specific situation, the members of this team may vary. The actual makeup of the team will ultimately be determined by the Incident Commander, the On-Scene Commander and the Well Control Specialist Team Leader.

It is imperative that the Tactical Command Post (TCP) be of sufficient size to hold all of the personnel directly working on the front lines, and have redundant means of cellular, satellite and landline communication equipment needed to communicate with the Incident Management Team (IMT) in Normangee, TX or Houston, TX at the Emergency Operations Center (EOC) which are secure. IT should help in establishing these secure communications.

2.2 Tactical Response Team Roles and Responsibilities (TRT)

2.2.1 On-Scene Commander – (Wellsite Supervisor/Production Superintendent)

On-Scene Commander Role

Responsible for organizing and managing at-the-scene tactical response operations in a safe and effective fashion and for keeping the Incident Management Team (IMT) informed about the nature and status of the incident and tactical response operations.

On-Scene Commander Responsibilities

Wellsite Team Leader

- Report incident
- Assume On-Scene Command until and unless relieved by a more qualified individual
- Establish temporary Tactical Command Post (TCP)
- Establish and maintain a clearly defined tactical response organization
- Establish appropriate communication network(s) and define a communication protocol for each network
- Alert other personnel in the area about the nature and location of the incident and if necessary, establish an isolation perimeter and evacuate non-responder personnel
- Account for all personnel
- Ensure own safety and that of fellow responders and work closely with Site Safety Officer
- Define boundary of isolation zone (e.g., Isolation Perimeter)
- Determine type and level of security needed to maintain Isolation Perimeter and if necessary, establish security task
- Institute resource check-in
- Evaluate/Assess situation to identify problem(s) to be addressed by tactical response personnel
- Develop solution(s) to problem(s) (e.g., strategy) and scale work needing to be done to manageable task
- Prioritize tasks as necessary
- Assign task leaders and allocated checked-in resources to tasks

- Take all appropriate and safe actions to
  - Control the source(s) of problem(s)
  - Limit the spread of emitted materials and their impacts
  - Protect sensitive environmental, social and economic resources
  - Request qualified spill cleanup organization
- Address span-of-control problems (identify task leaders & assign crews)
- Manage resources and keep track of resource status
- Delegate responsibilities to Aide(s)
  - Compile and maintain appropriate documentation
- Communicate with IC via Command Network

2.2.2 Deputy On-Scene Commander

Deputy On-Scene Commander Role

Responsible for assisting On-Scene Commander, particularly in regard to keeping track of checked-in resources, compiling information for field reports, and compiling and maintaining appropriate documentation.

Deputy On-Scene Commander Responsibilities

- Assist On-Scene Commander in keeping track of staged resources, if necessary, establish direct line of communication with Logistics Officer
- Assist On-Scene Commander in keeping track of resources assigned to carry out task
- Compile information for/prepare written field reports, obtain On-Scene Commander approval of reports
- Assist On-Scene Commander in monitoring Command Network
- Provide information to assist in development of Incident Action Plans (IAP)
- Assist On-Scene Commander in compiling and maintaining appropriate documentation
- Assume responsibilities of On-Scene Commander his in absence

2.2.3 Site Safety Officer (SSO)

Site Safety Officer (SSO) Role

Responsible for ensuring that all appropriate actions are taken to protect the health and safety of the On-Scene Tactical Response personnel and potentially impacted personnel.

Site Safety Officer (SSO) Responsibilities

- If not all ready on site, travel to incident scene, check in at Tactical Command Post (TCP), and report to On-Scene Commander
- Assist On-Scene Commander in determining safe approach guidelines and verify the existing zones
- Assist On-Scene Commander in defining Isolation Perimeter and in determining need to evacuate non-responders from Isolation Zone
- Receive guidance from On-Scene Commander on problem(s) to be addressed, solution(s) to problem(s) and task(s) to be performed
- Work with On-Scene Commander to institute personnel accountability system at incident scene
- Characterize hazards in area(s) where task(s) are to be carried out before task(s) is/are initialed
- Organize and manage a Site Entry Team to carry out on-site risk assessment
- Monitor work of Site Entry Team
- Identify & characterize environmental impacts
    - Coordinate with environmental response contractor(s)
- Define hazard control zones
    - Ensure all tactical responders are aware of location of all ‘Hot, Warm and Cold Zones’
- Determine level of PPE to be worn in both ‘Hot and Warm Zones’
- Determine level of decontamination to be carried out in ‘Warm Zone’
- Work with On-Scene Commander to develop emergency medical procedures
- Establish First Aid Station(s) at incident scene
- Monitor tactical response operations and order immediate cessation of any unsafe task or work practice

- Participate in all related investigations and then issue Safety Bulletin(s)
  - Fatalities
  - Injuries
  - Near Miss
  - Unsafe acts
  - Work Stoppage
- Compile and maintain appropriate documentation

2.2.4 Logistics Officer

Logistics Officer Role

Responsible for establishing and maintaining logistics and for coordinating the delivery of support services, materials, and equipment for the at-the-scene tactical response personnel.

Logistics Officer Responsibilities

- Work with the On-Scene Commander to identify the optimum location to stage resources
  - Identify exact location
  - Define and secure boundaries of area
  - Identify ingress and egress points into and out of area
- Identify and obtain personnel and equipment needed to operate area
- Segregate resources, by kind, in area
- Institute resource check-in/check-out procedures
- Establish a direct line of communications with On-Scene Commander
  - Keep On-Scene Commander informed about kind and quantity of resources in each area
- Work with Incident Management Team (IMT) Logistics Unit Leader to establish a Supply Network (if IMT is activated)
- Receive and process resource request generated by tactical response personnel
- Forward resource request that cannot be addressed with staged resources to the IMT Logistics Unit Leader via Supply Network
  - Receive follow-up reports from IMT Logistics Unit Leader on status of the efforts to obtain requested resources
- Provide On-Scene Commander or Aide status reports on resources checked in and available and resources that are en route to staging area
- Receive guidance from Site Safety Office (Staging Areas)
- Supervise demobilization of resources
- Compile and maintain appropriate documentation

2.2.5 Staging Officer

Staging Officer Role

Responsible for establishing and maintaining a staging area, and for coordinating the delivery of support services from a staging area, including food, water, shelter, PPE, and sanitation services for at-the-scene tactical response personnel, and fuel, water and lubricants for response equipment.

Staging Officer Responsibilities

- Travel to incident scene, check in at Tactical Command Post (TCP), and report to On-Scene Commander
- Work with On-Scene Commander and Logistics Manger to identify optimum location to stage resources
- If need for multiple staging areas
    - arrange for establishment of the staging areas
    - appoint a manager for each area
    - establish a direct line of communication with each manager
- For each staging area
    - Identify exact location
    - Define and secure boundaries of area
    - Identify ingress and egress points
    - Post signs to control traffic flow into and out of area
    - Identify and obtain personnel and equipment needed to operate area
    - Segregate resources, by kind, in area
- Institute a resource check-in/check-out procedure
- Establish a direct line of communication with Logistics Officer
- Keep Logistics Officer informed about kind and quantity of resources in each area
- Provide Logistic Officer status reports on resources checked-in and available in each staging area, and resources that are en route to each staging area
- Receive guidance from Site Safety Officer, obtain, and make available the food, water, shelter, and sanitary facilities necessary to support tactical responders
- Supervise demobilization of each staging area
- Compile and maintain appropriate documentation

2.2.6 Well Control Specialist Team Leader

Well Control Specialist Team Leader Role

Responsible for supervising at-the-scene source control operations.

Well Control Specialist Team Leader Responsibilities

- Travel to incident scene, check in at Tactical Command Post (TCP), and report to On-Scene Commander
- Assist On-Scene Commander in evaluating the situation, and/or in developing solution(s) (e.g., strategy) to address source control-related problem(s)
- Receive assignments from On-Scene Commander
- Supervise at-the-scene source control operations
- Ensure health and safety of all at-the-scene source control personnel
- Brief personnel assigned to carry out source control-related tasks and ensure that assigned personnel have information and equipment they need to carry out tasks safely and effectively
- Account for all assigned personnel and equipment
- Maintain span-of-control
- Keep On-Scene Commander informed about nature and status of source control operations
- Ensure that appropriate actions are taken to stop, isolate, and/or control source of incident
- Assess damage to affected facilities and take appropriate action(s) to minimize additional damage
- Identify location(s) of staging area(s)
- Provide Staging Officer information on resource needs
- Compile and maintain appropriate documentation

2.2.7 Wellsite Engineering

Wellsite Engineering Role

The role for this position will correspond to those employees occupying and of the engineering positions on location. This position should provide technical support to On-Scene Commander. Also, this position will be responsible for updating information on the nature and status of the response operation, and advise the On-Scene Commander on a variety of tasks.

Wellsite Engineering Responsibilities

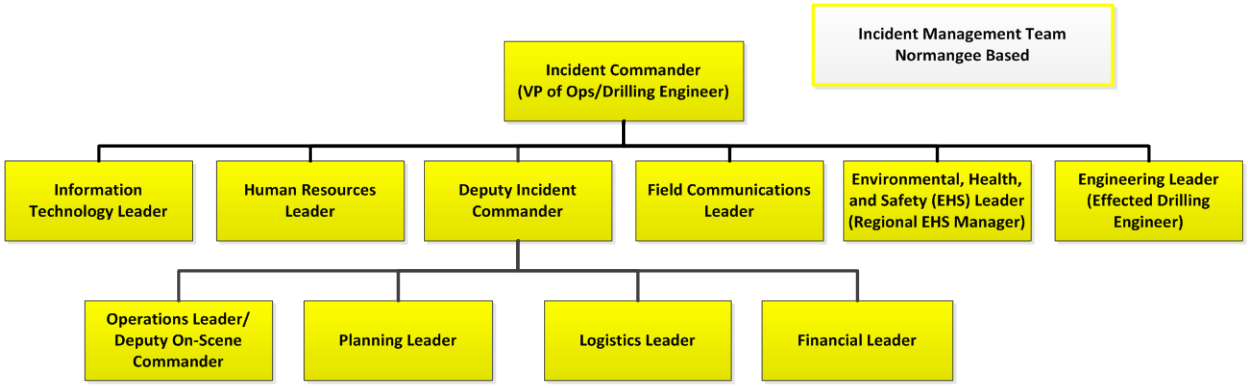
- Provide TRT with technical information as needed and supply needs
- Identify engineering problems and solutions
  - Outline work into manageable tasks on site
- Assign tasks to appropriate personnel
  - Maintain proper span-of-control
- Assume responsibility for tasks delegated by the On-Scene Commander
- Assist On-Scene Commander in the analysis of incident potential and preparation of strategic objectives and response priorities
- Address strategic objectives and response priorities as they relate to engineering operations
- Serve as primary person for the On-Scene Commander to prepare field reports
- Provide up-to-date information on nature and status of engineering details
- Represent engineering at all TRT meetings
- Assist the team in preparing objectives and field tasks required
- Assist the team in preparation of General Plan
- Keep On-Scene Commander informed of changing technical conditions
- Provide updates on nature and status of tactical response operations
- Consider need for an alternate or backup person for extended (24-hour) coverage
- Compile and maintain appropriate documentation

3 Off-Scene Incident Management Team (IMT)

3.1 Incident Management Team (IMT)

Members having operational authority of Halcón Resources operations will form the Incident Management Team (IMT) and operate in the Emergency Operations Center (EOC). Additional members may be required to complete the responsibility requirements for the IMT. The Incident Commander (IC) will be in charge of this team. The purpose of the IMT is to support onsite activity in any way requested, and to disseminate information about the status of the incident as necessary to other personnel or entities within Halcón Resources. Incident Management Team (IMT) members typically include the following:

- Incident Commander (IC)
- Engineering Leader
- Planning Leader
- Financial Leader
- Logistics Leader
- Deputy Incident Commander (DIC)
- Human Resource Leader
- Environmental, Health, and Safety Leader (EHS)
- Information Technology Leader
- Field Communications Leader



Depending on the specific situation, the members of this team may vary. The actual makeup of the team will ultimately be determined by the Incident Commander (IC).

An area for an Emergency Operations Center (EOC) has been designated as being the Normangee, Texas location. It is imperative the EOC be of sufficient size to hold the Incident Management Team (IMT) and have all the modern communications equipment needed to communicate with the Tactical Response Team (TRT) on location and the Crisis Management Team (CMT).

3.2 Incident Management Team (IMT) Responsibilities

3.2.1 Incident Commander – (Vice President of Operations or Drilling Engineer)

Incident Commander Role

The Incident Commander (IC) is responsible for the overall management of incident response operations, and for serving as the IMT's primary contact person with all involved or interested external parties. The Incident Commander (IC) will ensure that personnel safety is accorded the highest priority during conduct of incident response operations.

Incident Commander Responsibilities

- Establish and maintain an organization that is capable of providing management, direction to, and support for, at-the-scene tactical response operations
- Supervise incident response operations and ensure that they are carried out in a manner consistent with company policy, appropriate government directives, and the needs and concerns of impacted areas
- Analyze incident potential
- Establish strategic objectives and response priorities and ensure IMT and tactical response personnel are carrying out incident response operations in a manner consistent with objectives and priorities
- Ensure that all required and appropriate notifications have been made to Halcón Resources senior management, government agencies, and Halcón Resources partners, insurance and/or risk department
- Keep Halcón Resources senior management informed of the nature and status of the incident and incident response operations
- Serve as primary contact person for Halcón Resources senior management, government representatives, and Halcón Resources partners
- Review and approve request for non-Halcón Resources owned response resources, allocated critical resources, and authorized demobilization of resources
- Ensure that well control and response operations are carried out safely and are closely coordinated
- Monitor and evaluate effectiveness of well control and response operations
- Review and approve press releases and statements as they relate to incident response operations

- Approve and authorize implementation of Incident Action Plans (IAP)
- Approve and authorize implementation of general plan
- Consider need for an alternate or backup person for extended (24-hour) coverage
- Compile and maintain appropriate documentation

Well Control Considerations

- If surface control operations are attempted, most tactical plans and many strategic plans are made on-scene. This is due to the specialized nature of the work and the fact that the Well Control Specialist is on-scene (thus the requirement for a senior OSC). Incident Action Plans (IAP) is commonly coming from the scene for approval rather than being generated by the IMT in the office and sent to the OSC.
- Many in the strategic planning team, those planning how the well will be killed and those planning the relief well should mobilize on-scene to help implement the plans as part of the tactical teams.

3.2.2 Deputy Incident Commander

Deputy Incident Commander Role

Assist the Incident Commander (IC) in the overall management of incident response operations, and for serving as the IMT's secondary contact person with all involved or interested external parties. The Deputy Incident Commander (DIC) will ensure that personnel safety is accorded the highest priority during conduct of incident response operations.

Deputy Incident Commander Responsibilities

- Assume any responsibility delegated by the Incident Commander (IC)
- Ensure the Command Post (CP) is set up and made operational in a timely fashion
- Ensure that his/her Section gets organized in a timely fashion
- Assist Incident Commander (IC) in analysis of incident potential and development of strategic objectives and response priorities
- Coordinate activities of Section Leaders to ensure conduct of safe, effective and efficient emergency response operations
- Assist Incident Commander (IC) in ensuring that operations are carried out in a manner consistent with policy and appropriate government directives
- Focus on communications and address communications problems as they arise
- Ensure implementation of Incident Command System
- Chair IMT meetings, if instructed to do so by Incident Commander (IC)
- Follow-up on action items identified during formal IMT meetings
- Ensure that objectives and priorities are being addressed by balance of IMT and tactical response personnel
- Interface with others to ensure that their problems and solutions are addressed by the balance of IMT in a timely fashion
- Provide units with information on personnel, equipment, material and supply needs for the IMT staff
- Provide Incident Commander (IC) informal briefings, as necessary, on the nature and status of incident and emergency response operations
- Work with Operations and Engineering to ensure that appropriate documentation is compiled and forwarded to the Section Leaders

- Ensure that source control and response operations are closely coordinated, and resolve any conflicts that may arise between these operations
- Ensure that appropriate company and/or government directives are communicated to and followed up on
- Serve as secondary contact person for senior management, government representatives and local partners
- Fill in for Incident Commander (IC) as needed
- Consider need for a backup person for extended (24-hour) coverage
- Compile and maintain appropriate documentation

3.2.3 Engineering Leader – (Drilling Engineer)

Engineering Leader Role

The role for this position will correspond to those employees occupying any of the IMT engineering positions. This position should provide strategic direction and support to the Incident Commander (IC) and On-Scene Commander. Also, these positions will be responsible for receiving information on the nature and status at-the-scene tactical response operation, and provide information to the Incident Commander and other IMT staff.

Engineering Responsibilities

- Meet with Incident Commander (IC) and team for debrief
- Provide IMT with information on personnel, equipment, material, and supply needs
- Evaluate/analyze incident, identify operations problems and solutions, and organize work operations down into manageable tasks
- Assign task to appropriate operations personnel
    - Maintain proper span-of-control
- Assume responsibility for tasks delegated by Incident Commander (IC)
- Assist Incident Commander (IC) in the analysis of incident potential and the preparation of strategic objectives and response priorities
- Address strategic objectives and response priorities as they relate to work of operations
- Serve as primary IMT contact person for On-Scene Commander
    - Receive field reports from On-Scene Commander

- Review and ensure the appropriateness of strategy and tactics being employed by On-Scene Commander
    - Provide necessary strategic direction
- Provide IMT up-to-date information on nature and status of tactical response operations
- Represent operations at all formal IMT meetings
    - Brief Incident Commander (IC) and the members of the IMT on nature and status of work being done by operations section
- Assist the team preparing Incident Action Plans (IAP) in preparation of objectives and field assignments for Incident Action Plans
- Assign Engineer #1 to support On-Scene Commander in tactical preparation for surface control
- Assign Engineer #2 to begin strategic and tactical planning for kill operations
    - Work with hydraulic engineers (blowout modeling specialist contractors), fluids, and pumping contractors
- Assign Engineering #3 to begin strategic planning for a relief well(s)
    - What rigs are available for a relief well(s)
    - Begin evaluation for a relief well surface location
    - Work with relief well specialist on procedures for intersection and kill
- Assign Engineer #4 to gather onsite and archived data about the well and offset wells
    - Compile the data in a format that can be easily accessed by the IMT and TRT
    - Setup and maintain information center
- Assist the team in preparation of General Plan
- Ensure that personnel involved in response operations have the personnel, equipment, materials and supplies needed to carry out those operations in a safe, effective, and efficient manner
- Evaluate technical resources required outside company (petroleum engineering, geology and geophysics, blowout engineering specialist, service company specialist), mobilize as required
- Ensure that appropriate documentation is compiled by TRT and forwarded to engineering
- Consider need for an alternate or backup person for extended (24-hour) coverage
- Compile and maintain appropriate documentation

3.2.4 Human Resource Leader

Human Resource Leader Role

Responsible for addressing human resource issues that arise from response personnel, for providing Critical Incident Stress Debriefing services, for arranging grief counseling for personnel adversely impacted by incident- and/or incident-related injuries and fatalities, and for arranging humanitarian assistance to the families.

Human Resource Leader Responsibilities

- Obtain initial briefing from Incident Commander (IC)
- Attend IMT meetings and briefings
  - Relay important information to Human Resources personnel
- Provide Incident Commander (IC) with information on personnel
- Assume responsibility for any task(s) delegated by the Incident Commander (IC)
- Evaluate incident
  - Identify Human Resource-specific problems and solutions
  - Allocate into manageable tasks
- Provide Incident Commander (IC) periodic status reports
- Assist Incident Commander (IC) in analyzing incident potential and preparing strategic objectives and response priorities
- During a mass casualty incident
  - Serve as a principal advisor to Incident Commander
  - Apply company policy- Injury and Fatality Plan – Refer to ERP
- Compile and maintain appropriate documentation

3.2.5 Field Communications Leader

Field Communications Leader Role

Responsible for gathering information in the field and assisting the Corporate Communication Director/Communication Lead by ensuring they have access to the latest approved information and key messages. This position is responsible for media monitoring (including social media), gathering sentiment information from stakeholders and the public and interacting with responders in the field who are closest to the operational response.

3.2.6 Planning Leader

Planning Leader Role

The Planning Leader is a member of the Incident Management Team (IMT) staff and is responsible for the collection, evaluation, dissemination and use of information about the development of the incident and the status of resources.

Planning Leader Responsibilities

- Understand the current situation
- Predict the probable course of incident events
- Prepare alternative strategies for the incident
- Collect and process situation information about the incident
- Supervise preparation of the Incident Action Plan (IAP)
- Provide input to the Incident Commander (IC) and the On-Scene Commander in preparing IAP
- Chair planning meetings and participate in other meetings as required
- Reassign out-of-service personnel already onsite to Incident Command System (ICS) organizational positions as appropriate
- Establish information requirements and reporting schedules for planning section (e.g., Resources, Situation Units)
- Determine the need for any specialized resources in support of the incident
- If requested, assemble and disassemble Strike Teams and Task Forces not assigned to operations
- Establish special information collection activities as necessary (e.g., weather, environmental, etc.)
- Assemble information on alternative strategies
- Provide periodic predictions on incident potential
- Report any significant changes in incident status
- Compile and display incident status information
- Oversee preparation and implementation of the Incident Demobilization Plan
- Incorporate plans (e.g., Traffic, Medical, Communications, Site Safety, Spill) into the IAP
- Compile and maintain appropriate documentation

3.2.7 Environmental, Health, and Safety (EHS) Leader – (Regional EHS Manager)

Environmental, Health, and Safety (EHS) Leader Role

Responsible for supporting Site Safety Office and for providing expertise on safety issues that may arise during the conduct of emergency response operations.

Environmental, Health, and Safety (EHS) Leader Responsibilities

- Provide the Incident Commander (IC) with information on safety related issues and/or concerns
- Receive briefings from TRT Site Safety Officer
- Brief the Incident Commander on hazards present at the incident scene and measures being instituted to protect the response personnel against hazards
- Ensure compliance with relevant and governmental safety requirements
- Exercise emergency authority to prevent or stop unsafe acts
- Brief IMT staff on safety concerns and precautions and ensure key personnel are familiar with site safety issues
- Monitor personnel and contractors for conformance with incident specific Site Safety Plan and associated requirements
- Set up a system to identify and eliminate safety hazards in all aspects of emergency response operations
- Ensure response personnel have the necessary level of safety training
- Attend IMT meetings and provide reports on the nature of safety concerns and status of work on safety related tasks
- Coordinate safety related communications
- Work with the Site Safety Officer to prepare and issue safety bulletins on issues affecting or likely to affect work safety
- Work with the medical unit to establish procedures for handling medical emergencies and evacuations
- Provide information and advice to the Site Safety Officer, Incident Commander (IC) and others regarding safety issues associated with the incident
- Assist the Public Relations Leader in describing any safety related issues to the media and public
- Obtain and provide the Site Safety Officer copies of Material Safety Data Sheets (MSDS) for hazardous chemicals on location

- Provide the Incident Commander (IC) advice on when it is safe to enter or return to an impacted area
- Provide guidance and procedures concerning environmental response issues
- Review the Incident Action Plan (IAP) and, if necessary, work with the Site Safety Officer to prepare changes to the Site Safety Plan
- Consider the need for an alternate or backup person for extended (24-hour) coverage
- Compile and maintain appropriate documentation

3.2.8 Financial Leader

Financial Leader Role

The Financial Leader is responsible for all accounting and financial aspects of the incident and any other administrative requirements.

Financial Leader Responsibilities

- Function as the head of Finance Section
- Set up the accounting system to be used for the incident
- Oversee all accounting and financial aspects of the incident
- Prepare periodic budget reports for the Incident Commander (IC)
- Provide Deputy Incident Commander with information on personnel, equipment, material and supply needs
- Serve as financial advisor to the Incident Commander
- Prepare summary reports which examine the financial status and options and courses of action that can be followed
- Determine applicable short term and long term financial plans
- Advise Incident Commander (IC) and IMT staff on type of documentation which must be compiled to support incident related expenditures
- Review documentation to ensure it is being compiled in a manner consistent with documentation guidelines
- Handle all contract-related financial matters
- Provide financial guidance on terms and conditions of new or amended contracts
- Compile and maintain appropriate documentation

3.2.9 Logistics Leader

Logistics Leader Role

The Logistics Leader provides all resources and support for the response operations, including procurement, delivery arrangements and deployment of the resources. Resources may include facilities, transportation, supplies, equipment, maintenance, food, water, shelter, staffing support and any services and materials in support of the incident.

Financial Leader will support the Logistic Leader throughout the duration of the incident. In small incidents the Logistics Leader may also be responsible for financial and cost analysis aspects of the incident.

Logistics Leader Responsibilities

- Facilities
- Transportation vehicles and supplies
- Equipment
- Materials
- Equipment Maintenance
- Food/water/shelter supplies and facilities
- Communications equipment and personnel
- Personnel support
- Prepare periodic status reports for the Incident Commander (IC)
- Provide On-Scene Logistics (Staging) with the personnel, equipment, material and supply needs
- Compile and maintain appropriate documentation

3.2.10 Information Technology Leader

Information Technology Leader Role

This person will work with the Incident Commander (IC) and will be responsible for organizing and managing all communication equipment at the Emergency Operations Center (CP) so as to communicate and transfer data to the On-Scene Command Post as well at the Incident Management Team (IMT) and the Crisis Management Team (CMT).

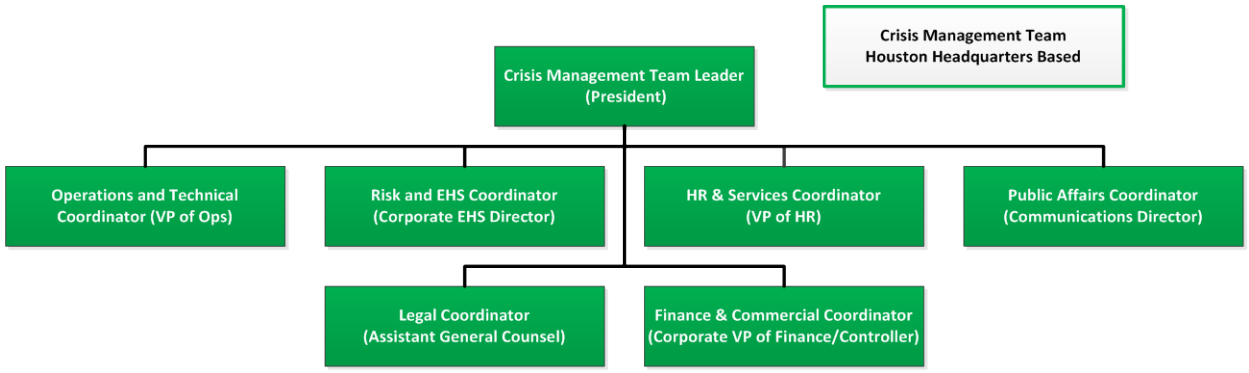
Information Technology Leader Responsibilities

- Provide the Incident Commander (IC) with information on personnel, equipment, material and supply needs
- Organize and manage all communications related activities
  - Secure communications
- Serve as principle advisor to the Incident Commander (IC) on all matters relating to internal and external communications infrastructure
- Develop proactive methods of addressing 'communication' concerns
  - On-Scene equipment
  - Command post equipment
  - Communication problems between On-Scene equipment and CP equipment
  - Equipment limitations
  - Others
- Obtain necessary approvals from the Incident Commander prior to installing communications networks
- Provide information on schedules related to the communications' center
- Consider the need for an alternate or backup person for extended (24-hour) coverage
- Compile and maintain appropriate documentation

4 Crisis Management Team (CMT)

The key to effective emergency response is to have a pre-established organization, on-call and capable of mobilizing and responding as required by different levels of emergency. It should be staffed by personnel with the appropriate experience, organized into a team, with allocated and defined roles and practiced in dealing with emergency situations. Crisis Management Team (CMT) members typically include the following:

- Crisis Management Team Leader (President)
- Risk and EHS Coordinator (Corporate EHS Director)
- Public Affairs Coordinator (Communications Director)
- Finance & Commercial Coordinator (Corporate VP of Finance/Controller)
- Operations and Technical Coordinator (VP of Ops)
- HR & Service Coordinator (VP of HR)
- Legal Coordinator (Assistant General Counsel)



Emergency teams are required for each incident location. The formality, composition and organization of the teams will be heavily dependent on local conditions and needs. The emergency organization at each location should be as similar as possible to the normal day-to-day organization. It is the CMT role and responsibility to support the IMT's and TRT's onsite command and control response operations to all incidents, which occur.

4.1 Crisis Management Team (CMT) Responsibilities

- To manage the impact on the company's image, operability and liabilities
- To provide support and advice to the IMT and TRT where an incident is occurring or has occurred
- To keep the Chief Executive informed
- To provide advice and liaison with authorities
- To manage the company's media response and approve the local/national media response
- To manage the HR response, where appropriate
- To liaise with the appropriate authorities, agencies and companies
- To liaise with Joint Venture partners, as appropriate
- To inform Financial Institutions and Shareholders

The interface between CMT and IMT will be defined in the Emergency Response Manual.

A specific CMT leader will be available at all times, who will be of appropriate authority both operationally and financially, and based in the corporate office. In all situations, which have resulted in the mobilization of the CMT, it is the CMT leader's responsibility to report the situation to the Chief Executive Officer (CEO).

The actions of the CMT will vary depending on the nature of the crisis and it is the CMT leader's responsibility to determine the extent of the response required. The CMT may call on additional corporate staff to assist them in responding to any incident situation.

All CMT members are required to read and familiarize themselves with this document, in particular their own respective functions. CMT members shall be included and play active roles in response exercises. The primary roles and responsibilities of the Crisis Management Team members are outlined. The key positions are:

- Crisis Management Team Leader (President)
- Operations & Technical Coordinator (VP of Ops)
- Risk & EHS Coordinator (Corporate EHS Director)
- HR & Services Coordinator (VP of HR)
- Public Affairs Coordinator (Communications Director)
- Finance & Commercial Coordinator (Corporate VP of Finance/Controller)
- Legal Coordinator (Assistant General Counsel)

Additional personnel may be mobilized by the CMT Coordinators to provide support and assistance. The personnel mobilized to provide support would be, so far as possible, from the appropriate department or have the appropriate skill to provide the required support. Additional support may include:

- Scribe
- Reception
- Security
- Communications (IT)

4.2 Key Crisis Management Team (CMT) Position Responsibilities

4.2.1 Crisis Management Team Leader – (President)

- Manage the overall response of the CMT
- Informing and liaising with the Chief Executive
- Responsible for coordinating and providing contact with media, third parties, financial expenditure and legal advice

4.2.2 Operations & Technical Coordinator – (Vice President of Operations)

- Acts as the communication link with IMT Incident Commander (IC)
- Provides drilling, operational and subsurface technical advice and support

4.2.3 Risk & EHS Coordinator – (Corporate Environmental, Health, and Safety Director)

- Provides risk and EHS advice and support to the CMT and IMT
- Maintains CMT response in line with company emergency response procedures
- Maintains status boards
- Coordinates office security

4.2.4 HR & Services Coordinator – (Vice President of Human Resources)

- Coordinates the CMT HR and IT Support
- Provides advice to employees
- Coordinates evacuation/repatriation/emergency medical treatment of local and expatriate personnel & families
- Provide Next of Kin response, in accordance with Injury and Fatality Plan
- Coordinates communications center and reception

4.2.5 Public Affairs Coordinator – (Communications Director)

- Coordinates public affairs response
- Coordinates liaison with external financial bodies
- Prepares corporate statements to the media
- Approves the content of statements to the media
- Provides media representation to the IMT and TRT, as needed

4.2.6 Finance & Commercial Coordinator – (Corporate Vice President of Finance/Controller)

- Provides Financial and payroll advice and support
- Approves extraordinary expenditures

4.2.7 Legal Coordinator – (Assistant General Counsel)

- Provides legal advice and support to CMT, IMT and TRT
- Communications with partners, agencies and other parties concerning all legal issues
- Reviews and authorizes all media documentation from a legal standpoint

Additional personnel may be called upon by the Crisis Management Team Leader to provide support and assistance. The personnel mobilized to provide support would be, so far as possible, from the appropriate department(s) or have the appropriate skill to provide the required support.

Scribe

- Providing administrative support to the CMT members
- Record all relevant incident information under the direction of the CMT Leader

Reception

- Meet and direct people that arrive in the office to the appropriate location as directed by the CMT Leader
- Direct all incoming calls to the communications personnel

Security

- Secure access to the office except for persons approved by the CMT Leader and controlled access areas

Communications

- Receive all incoming calls and divert them as advised by the HR Leader
- Monitors and gathers information from multiple media channels and from the field communications lead for use by the Public Affairs Director and Crisis Management Team
- Under the supervision of the Communication Director, posts approved updates to the company website and social media channels if appropriate

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Section 3 Logistics

Contents

1 Introduction

Excluding the organization of the well control intervention team, the most complicated and typically overlooked components of implementing an emergency project are the logistics of required services and equipment. Many of these services are very specialized and may not be available in the immediate area. Also, knowledge of many of these services and companies which provide such services may be unknown to the operating company in regards to an emergency intervention project.

Prior knowledge of what will be required and how it can be obtained will be extremely important. One of the very first assignments of the Incident Commander should be to designate the Logistics Leader to locate and define the availability of equipment and services required to respond to a well control event.

In a well control event, efficient mobilization of the necessary equipment will depend on knowledge of what equipment is needed. This section provides guidance on such logistical considerations.

Common equipment, materials and personnel critical for a well control event are listed below, although not all items will be required considering every well control event is unique and response and mitigation actions must be tailored to suit.

Halcón Resources will need dedicated support personnel working in the areas of transport, materials acquisition, logistics, contracting, accounting, and communications if a well control event occurs.

It is critical that the Incident Command team assemble, at a minimum, on an annual basis to conduct periodic drills on response to emergency scenarios. Scenarios should progress from Level I to Level III (blowout stage) to ensure that all Incident Command section leaders are provided an opportunity to participate. In addition, to serving as a periodic refresher, the drills can be utilized to implement ‘Management of Change’ including revised policies and procedures as well as provide the opportunity to verify the contact information for critical personnel, contractors and vendors.

2 Logistics and Equipment

2.1 Equipment Transport

Depending on the remoteness of the location, weather, and other factors, Well Control Specialists can typically be on location in the Woodbine Region within 24 to 48 hours.

After initial inspection and subsequent Initial Planning Cycle by the TRT, IMT and Well Control Specialists, all needed material, equipment and personnel should be procured by the Logistics Leader and made ready to mobilize.

All heavy firefighting equipment and specialized equipment will have to be trucked into the Woodbine Region. From the Houston, TX it is 5 to 6 hours by truck to the staging area in the Woodbine Region.

Figure 1: Drive Time Map - 24hr & 48hr times from each package location

The following is a Texas map of the counties wherein Halcón Resources Woodbine assets are located. This information needs to be reviewed and updated annually at a minimum.

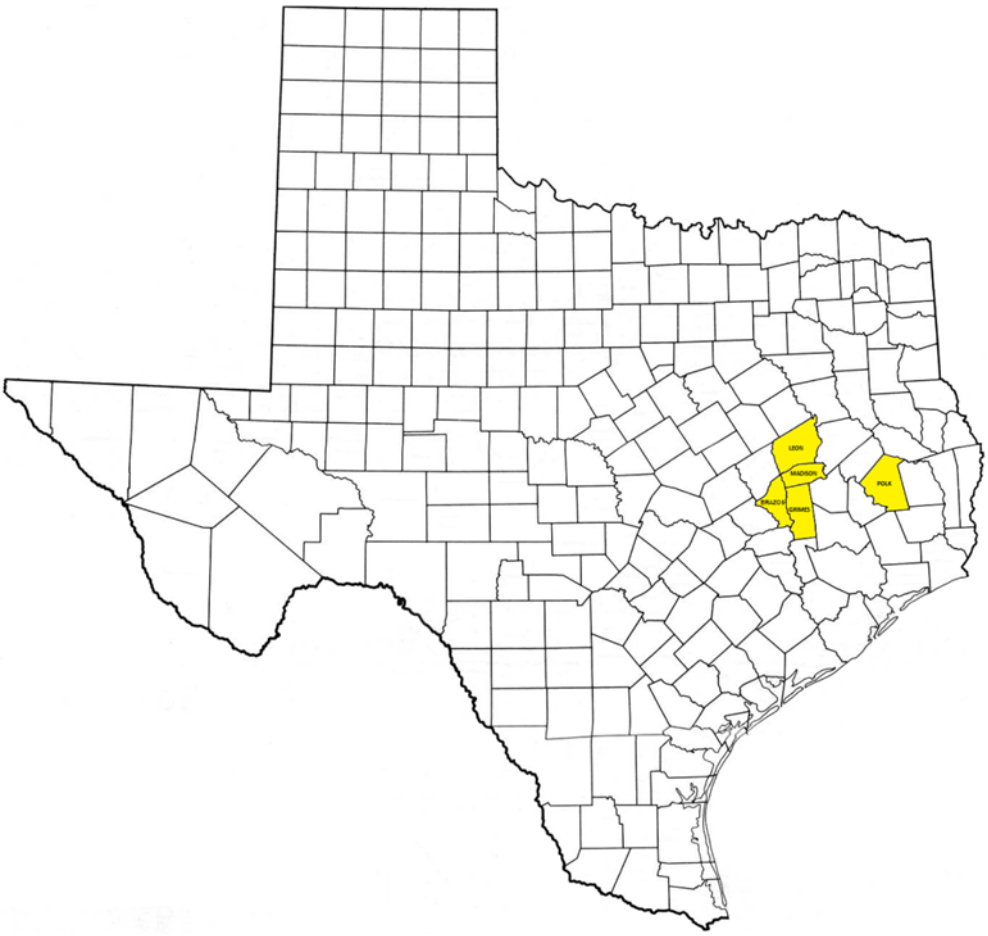

Figure 2: Texas - Woodbine Assets

2.2 Water Supply

Probably the most important step when controlling a Level III incident is establishing a water supply which is plentiful and consistent. Surface intervention of a blowout requires massive volumes of water. The plan will be to set up two (2) 4000 or 6000 gpm pumps to supply water. Also, it will be necessary to use 14-20 inch pipeline from the fire pumps to the fire main manifold which will be placed on the upwind edge of the location. This would enable the use of water supplied at 153 psi discharge to reach the fire main and the monitor sheds with proper pressure. The two 12,000 barrel water pits should be placed up wind of prevailing winds.

Water volume requirements vary from one blowout to another. For example, only one pump would be required for a minor fire (with backup pump circulating water as a redundant system) for a minor fire, whereas two or more pumps would be required for a major rig fire, thus doubling the water volume required. Typically, a benchmark of 1,000,000 gallons per day (24,000 bbls per day) is used in the Well Control Contingency Plan calculations.

2.2.1 Water Supply Calculations

A well on fire requires a tremendous volume of water. For example, the following calculations show how fast 1,000,000 gallon (24,000 bbls) pit would be emptied using various capacity fire pumps:

- 1,000,000 gallons/(6,000 GPM + 6,000 GPM) = 83 minutes
- 1,000,000 gallons/(6,000 GPM + 4,000 GPM) = 100 minutes
- 1,000,000 gallons/(4,000 GPM + 4,000 GPM) = 125 minutes

2.2.2 Water Supply Calculations – *Using Tankers Only*

The following calculations gives the number of tanker loads needed to replenish the pit with water:

- $1m^3$= 6.29 bbls
- $24m^3$ tanker capacity x 6.29 bbls/m^3=150 bbls
- 24,000 bbls/150 bbls per load= 160 tanker loads

The following calculation factors in a water recovery rate of 30%:

160 tanker loads x (1.0-.3) = 112 tanker loads.

Using the two minimum 4,000 GPM fire pumps, it would require 61 tanker loads per hour to maintain operations.

With a remote pit containing an additional 1,000,000 gallon capacity for a total of a 2,000,000 gallon capacity (48,000 bbls), operations could be maintained for four (4) hours using two 4,000 GPM pumps. The flowing calculations gives tanker load totals for 10 hours of winter time daylight operations:

- (10 hours operations) – (4 hours water supply on hand) = 6 hours additional water supply needed
- (6 hours) x (61 tanker loads per hour) = 366 tanker loads
- (366 tanker loads) / (10 hours) = 37 tanker loads per hour

37 tanker loads per hour, although cumbersome, is far more manageable than 61 tanker loads per hour. However, using the above calculation, at the end of 10 hours the pits will be dry. The following calculation gives the tanker loads per hour to overnight replenish the 2,000,000 gallons (48,000 bbls):

- 48,000 bbls / 150 per load = 320 tanker loads
- 24 hours – 10 hours daylight operations = 14 hours to refill pits
- 320 tanker loads / 14 hours = 23 tanker loads per hour overnight

2.2.3 Water Supply Calculations – *Using Water Wells*

The following calculation gives the amount of water needed to replenish the pit from a water well:

NOTE: Some of the calculations below have been rounded.

Using 2 3,200 GPM the water usage is 6,400 GPM

- 1,000,000 gal / 6,400 GPM = 156 minutes
- 156 minutes / 60 min per hour = 2.5 hours water supply

A 30% recovery rate extends the water supply to just over 3 hours

- 2.5 x 1.3 > 3 hours

If 1,000,000 gal is used in 3 hours, then 3,000,000 gal is used in a 9 hour work day.

The average water well in most blocks in the Woodbine Region produces [Insert bbls] bbls/hour [Insert bbls] bbls/hour x 42 gal/bbl = [Insert gal/hr] gal/hr

With the pit full (1,000,000 gal) in the morning, 2,000,000 additional gallons would need to be produced in a 9 hour period.

- 2,000,000 gal / 9 hours = 220,000 per hour needed production
- (220,000 gal/hr) / ([Insert gal/hr] gal/hr/well) = [Insert Number] water wells

The alternative would be to construct 2 1,000,000 gallon pits.

On hand supply would then be 6 hours with the need to replenish 1,000,000 gallons in 9 hours.

- 1,000,000 gal / 9 hours = 110,000 gal/hr replenish rate
- (110,000 gal/hr) / ([Insert gal/hr] gal/hr/well) = [Insert Number] water wells

To replenish the dry pits over night the water volume would be as follows:

- 24 hours – 9 hours = 15 hours to replenish the pits
- 2,000,000 gal / 15 hours = 130,000 gal/hr
- (130,000 gal/hr) / ([Insert gal/hr] gal/hr/well) = [Insert Number] wells

NOTE: If necessary, water wells could be augmented by water tankers.

NOTE: If the above minimums prove to be logistically unfeasible, then operations would necessarily have to be planned around the water supply that is available.

2.2.4 Water Supply Storage

The remote pits are usually about 500 yards from the well and they can be dug, lined and filled with water while debris is being removed from the well, a process that will take days.

2.3 Role of Rig Contractor

A key to successful well control is fast and effective mobilization of the required support. The following list is not complete, however can be useful as a reference as to what may be required. The greatest key team member if a well control event is experienced will be the rig contractor, especially if the crew is experienced in how to acquire local available services, equipment and materials. The rig crew may be needed to assist the Well Control Specialist. Halcón Resources should hold a pre-planning meeting with the rig contractor and discuss Joint Operating Procedures and develop a Joint Operating Manual. The Joint Operating Manual (JOM) would discuss procedures for the following examples:

- Purchasing order system
- Added staff from rig contractor to handle various duties
- Spare equipment sources (e.g., BOP's, choke manifolds, etc.)
- Welding/fabrication sources
- Oilfield supply sources
- Implementation of the fire water system
- Bridging documentation and procedures for Joint Operations

2.4 Firefighting Equipment and Material

2.4.1 Typical Dimensions of Major Firefighting Equipment

The recommendable basic equipment is listed below with the rating and weight limit of each.

FIRE PUMP: Integrated on skid (pump capable of 4000-6000 GPM with 425 feet of head): 13’ x 7’ x 7.5’ (10,000 lbs.) Two pumps required.

TRANSFER PUMP: Integrated on skid (pump capable of 4750 GPM with 100 feet of head): 13’ x 7’ x 7’ (9,000 lbs.). Two pumps required.

PIPE RACK UNIT: Discharge piping and suction lines for pumps: 33’ x 7’ x 7’ (20,000 lbs.). One unit required.

JOB BOX/JOB CONTAINER: 6’0” x 4’4” x 6’2” (3,300 lbs.)

2.4.2 Equipment List for Underground Blowout

The major items that may be required are as follow:

- Cementing pump and cementing lines
- Cementing batch mixer or additional mud mixing tanks
- Cased hole wireline unit
- Pressure/Temperature log, Noise/Temperature, Magna Range, Cast Iron Bridge Plugs, CBL or Stuck Pipe Log, perforators, drill collar severing tool, gyro
- Possible additional stimulation pumps (higher rates and/or pressures required)
- Centrifugal pumps (mud transfer and circulation)
- Suction hoses and mud transfer lines (additional mud tanks and water pit)
- Sack cement and pure bentonite for bentonite-cement-diesel oil-plug
- Medium & course LCM materials (KwickSeal, mica, nut plug, ground CaCO3)
- Additional mud products for quick mix (gel, water, caustic, barite, lignosulfonate)
- Rate gyro for running on drill pipe for better relief well target (sever gas flow)
- Initiate relief well planning (severe gas flow, potential loss of surface access)
- Additional mud storage tanks
- Inflatable packer (unable to dynamically kill, due to a hole in casing)
- Handheld radios for site communication (Intrinsically Safe)

2.4.3 Equipment List for Surface Blowout without Fire or Rig Removal

- H_2S/Paramedic services
  - Detection equipment
  - Breathing air equipment
- Welding/fabrication contractor
  - Welders
  - Welding supplies
  - Welding equipment
  - Fabrication equipment
- Delivery services
- Machine shop
  - Custom tool fabrication
  - Modification
- Pumping/cementing services
  - Cementing unit
  - Batch mixer
  - Blender
  - Spare tanks
  - Pump lines
  - Additional Horse Power
- Medical evacuation services
- Fire pumps and associated equipment
- Well Control technical advisor
- Two air compressors (185 CFM-150 PSI) for air tools and engine starting
- 75 kg wheel mounted fire extinguishers, additional smaller fire extinguishers
- Flare pistol or rifle with flares
- Video and still photographer to record operation
- Location security and location access control of non-essential personnel
- Portable generators and light plants (with grounding)
- Miscellaneous common oil field supplies and tools
- Handheld radios (10 minimum)
- Diesel powered centrifugal pumps for fire protection, water transfer
- One reel of 1” to 1-1/8” (25 mm to 28 mm) soft lay steel cable for tie-downs, snub down lines and winches

2.4.4 Equipment List for Major Rig Fire

In addition to the equipment listed above, the following equipment, materials and services will be required:

- 2”, 3” and 4” A36 steel plate (1 square meter)
- Structural steel
  - Channel iron
  - Box tubing
  - H beams
  - Round tubing
- Air conditioned rest and medical stations
- 6” pipeline pipe and 8-5/8” – 9”5/8” 8RD casing
- Water pumps for pipeline
- Light plants and generators
- Carpentry crews and materials (plywood, boards, nails, etc.)
- UPS power supply for operations center
- High pressure discharge lines (Halliburton, Schlumberger, BJ (steel or Coflex))
- Additional horsepower (Halliburton, Schlumberger BJ)
- Over 50 handheld radios with extra batteries and multiple re-chargers
- 5 long range mobile units
- 1”, ¾” and ½” wire rope and cable clamps for slings

2.4.5 Normal Oilfield Services

Other considerations include such services as supplies as are normally used in oilfield operations. The following is a partial list of the types of services or materials which may be needed.

Oilfield Services and Materials:

- Mud supplies and mixing equipment
- Water tanks
- Environmental
- Rental tools
- Communications
- Cementing stimulation services
- Slick line
- Open hole E-line
- Cased hole E-line
- Well testing
- Wellhead maintenance
- Hot tapping
- Nitrogen

2.4.6 Personal Protective Equipment (PPE), (Personnel and Equipment)

- Emergency medical staff, (on location standby)
- Communication room complete with phone, fax, satellite phone, computers
- Decontamination area for personnel (change room) and equipment
- Wind socks
- Flagging tape
- Two way radios with headsets, extra batteries, charging stations
- Work gloves and ear plugs for work force
- Weather monitoring station, updated regularly
- Living accommodations for crew
- Meals for all work force
- H_2S equipment (if necessary)
- Drinking (bottled) water
- Rain suits
- Rubber boots

2.4.7 Support Personnel

- Well Control Engineer/Specialist (3 minimum)
- Well Control HSE Specialist (1 minimum)
- Roustabouts or drilling crews (6 men minimum)
- Air monitoring crew with equipment
- Environmental response team with equipment
- Weatherford/WELLCAT Specialist
- Choke Specialist
- Wellhead Specialist
- Snubbing Specialist
- Service Company Well Control Team
- Relief Well Specialist
- Translator, if necessary
- Ambulance or EMT services

3 Summary of Critical Worldwide Contractors

3.1 Firefighting Equipment and Services

Firefighting equipment and services are required during a large surface fire. Special high volume pumps, fire suppression chemical, and specialty deluge systems are critical for effective fire containment and control.

- Boots & Coots 281-931-8884 **24-hour response hotline**

3.2 Specialty Well Control Equipment and Services

Typical specialty equipment and services include manifolds, piping, connectors, valves, plugs, wellhead cutters, freezing, tapping, stingers, and capping equipment. Application depends on the project nature, so sourcing can be performed by those experienced with well control, including Well Control Specialist, other critical advisors and the Well Control Team (WCT). Some services can also be performed and/or provided by the firefighting and Well Control service companies.

- Boots & Coots 281-931-8884 **24-hour response hotline**
- Blowout Tools, Inc. 281-784-4730
- Great White/Archer 405-285-5812
- Halliburton 281-575-3000
- Hytorc 201-512-9500
- MYOCO 713-723-0110
- Cudd Pressure Control 832-295-5555
- Port-a-lathe 713-747-0090
- Wild Well Control 281-784-4700
- EXPRO 713-463-9776
- WELLCAT-Weatherford 800-935-5228
- Schlumberger-Camco 713-375-3494

3.3 Snubbing Equipment and Services

In some cases, snubbing may be the most effective response. Several companies offer professional snubbing services including supervision, snubbing units and equipment, and safety services. A review of recent experience, personnel, and safety record is important during qualification.

- Boots & Coots 281-931-8884 **24-hour response hotline**
- ISS/ Superior Energy 281-784-4700

3.4 Directional Drilling Services

Effective directional drilling equipment and personnel is essential during a relief well project, if necessary. Professional and precision directional drilling services is mandatory. Two directional rig supervisors, with previous relief well experience including extensive knowledge of steerable systems, horizontal drilling, MWD, surveying, rig site computers, and drilling under demanding circumstances, are recommended to provide 24-hour operational supervision. Lead time may be required for special tools not typically available in the area. Specification for tools which provide versatility and drilling performance are recommended. Full service packages should be investigated as these can add cohesiveness to the team approach.

- Halliburton-Sperry 281-871-4469
- Schlumberger 713-375-3494
- Baker Hughes INTEQ 713-439-8600
- Scientific Drilling Int'l 281-214-7600
- Gyro Data 281-213-6300
- Pathfinder 713-375-3494

3.5 Specialized Directional Drilling Equipment

When a relief well is necessary, specialized directional drilling equipment can be instrumental for wellbore directional control. Special equipment may include open-hole and cased-hole sidetracking tools, surface adjustable mud motors, down-hole adjustable stabilizers, large diameter hole steerable systems and a variety of non-magnetic tools and tubular. Many of these tools can be obtained from the directional drilling company. These types of equipment are typically used to enhance drilling performance or directional response.

- Halliburton 281-871-4469
- Anadrill Schlumberger 713-375-3494
- Baker Hughes INTEQ 713-439-8600
- Weatherford 713-693-4000

3.6 Directional Surveying Services

Borehole surveying on a relief well will require several types of systems to ensure the borehole position uncertainty has been minimized. During drilling, a real-time data transmission MWD system is recommended, followed by a high accuracy gyroscopic tool at critical points. Possibly, the new generation electronic magnetic multi-shot tools may be applicable. Some applications may also require a magnetic steering tool. Many of the directional drilling service companies can provide some or all of the surveying tools. Availability of highly sophisticated systems is typically limited. Sourcing of various tools, possibly through several companies, may be warranted.

- Halliburton-Sperry 281-871-4469
- Schlumberger 713-375-3494
- Baker Hughes INTEQ 713-439-8600
- Scientific Drilling Int'l 281-443-3300
- Gyro Data 281-213-6300
- Pathfinder 713-375-3494

3.7 Electromagnetic Ranging Services

These specialized logging services are critical for the initial location, monitoring, and ultimate intersection of the blowout well during relief well drill, if necessary. Currently, only two companies provide professional subsurface casing detection services. Typically, availability of equipment and crews is not a complication, but should be analyzed early during the course of the project. Considerations include 48-hour mobilization, and commercial aircraft transportable tools and equipment.

- Scientific Drilling Int'l 281-443-3300
- Vector Magnetics 607-273-8351

3.8 Specialized Logging Equipment and Services

At times some specialty wellbore logging services are necessary to monitor, identify, and measure mechanical, dynamic, and geologic wellbore characteristics. Special logging tools and services may include seismic, temperature, acoustics/noise, pressure, geology, flow, nuclear, and wellbore stability. Most of the international well logging companies can provide these services, but may require sourcing from several companies.

- Baker Atlas 713-439-8600
- Halliburton Logging 281-575-3000
- Schlumberger 713-375-3494
- Weatherford 713-693-4000

3.9 High Pressure Pumping Services

High pressure pumping services are essential for kill operations and some specialty well control services. These companies can provide the required pumping plant, ancillary equipment, and experienced personnel. In some geographical locations, some companies may not have available all necessary equipment making logistics important during planning. The company selected for the pumping kill may or may not be the cementing service vendor.

- Halliburton 281-575-3000
- Schlumberger 713-375-3494
- BJ Services 713-462-4239
- High Arctic 403-508-7836

3.10 Acidizing/Fracturing Services

Acidizing and fracturing services may be used to assist in establishing direct communication with the blowout well. This service is typically available through the major cementing and high pressure pumping companies. Many pieces of specialized equipment may be required, including stimulation equipment, pumping units, intensifiers, blenders, acidizing/fracturing fluids, chemicals, agents, and storage vessels.

- Halliburton 281-575-3000
- Schlumberger 713-375-3494
- BJ Services 713-462-4239

3.11 Flexible High Pressure Hose Equipment

This item is required during rigging up the kill equipment from the pumping plant to the wellhead. During a relief well operation that includes a BOP arrangement, several long lengths of flexible hose are necessary. These hoses come in varying diameters and pressure ratings, and maybe in short supply. Availability and logistics are critical considerations for long lengths of large diameter, high pressure hose. Pumping vendors, rental/supply, and specialty equipment companies may have these items in stock.

- Technip Coflexip 33 (0) 1 47 78 24 00
- Weatherford 713-693-4000

3.12 Blowout Preventer (BOP) Equipment

An extensive amount of blowout prevention tools are required during an intervention project. These may include multi-ram stacks, annular preventers, diverters, hydraulically actuated valves, large diameter outlet spools, crossovers and adapters, connectors, various ram types, manifolds, hydraulic control units, choke and kill lines, and BOP test stumps. This equipment can be obtained from either the manufacturer or rental tool companies. For all cases, equipment should have mechanical, pressure, and function tests properly performed, and the proper certification should accompany the equipment when delivered to the logistics or well control site.

- Cameron 713-513-3300
- Hydril 713-635-5291
- NOV 713-375-3700
- WELLCAT-Weatherford 713-693-4000

3.13 Wellhead Equipment and Services

During a capping operation, several wellhead components are required for an effective well control response. Typical equipment used includes multi-bowl and single-bowl wellheads, crossovers, valves, seals, slips and pickoffs, tubing heads, injection tools, adapters, and flanges. Many items can be obtained as an off-the-shelf item from various suppliers and manufacturers.

- NOV 713-375-3700
- Cameron 713-513-3300
- Dril-Quip 713-939-7711
- FMC Energy Services 281-591-4000
- GE Oilfield Services 832-325-4200

3.14 Specialty Drilling Equipment

Some specialty drilling equipment is necessary during a relief well project, if necessary. This may include rotating heads, stabbing valves, modified flow lines, and right floor recorders and readouts. Most of the equipment can obtained through drilling tool rental companies, drilling contractor, or may have to be fabricated on-site.

- MI Swaco 713-375-3494
- Williams Tool-Weatherford 713-693-4000

3.15 Specialty Downhole Fishing Services

In the event of fishing or snubbing operations, special fishing services and equipment may be required. Equipment may include those used for sidetracking, coiled tubing, packer retrieval, whip-stocking, junk milling, and jarring.

- Boots & Coots 281-931-8884 **24-Hour Response Hotline**
- Baker Oil Tools 713-439-8600
- NOV 713-375-3700
- Schlumberger 713-375-3494
- Weatherford International 713-693-4000
- Logan Oil Tools 281-219-6613

3.16 Specialty Packers and Services

Specialty packers for temporary isolation, testing, and plugging are required. Types of packers may include, mechanical, hydraulic, cased hole and open hole, wireline, and drillstring set configurations. Many specialty packers have been designed, some for kill operations, which may not be known by a local office, or available within the standard service company catalogs.

- Halliburton 281-575-3000
- Baker Oil Tools 713-625-4200
- TIW 713-729-2110
- Weatherford 832-590-4000

3.17 Perforating Services

Perforating services could be required if a relief well intervention project is undertaken. Several companies, including those offering wireline logging, can supply this service. Some companies have available special relief well perforators with proven results. In most cases, tubing-systems are the most applicable. The ability to test the perforators, under scenario conditions, for project effectiveness is important.

- Halliburton 281-575-3000
- Schlumberger 281-285-1300
- Weatherford 713-693-4000
- Baker Hughes 713-625-4200

3.18 Specialty Demolition and Explosive Services

At times, demolition and explosive services may be necessary to sever or remove damaged rig equipment, tubular, casing strings, earth and debris. Both unshaped and shaped charges may be required. All the well control and firefighting companies offer limited explosives services for debris removal and flame extinguishing. Other specialty companies offer bulk purchases of explosive and experienced service personnel for use of unconventional and/or sophisticated operations.

- DuPont 302-774-1000
- Halliburton 281-575-3000

3.19 Specialty Drilling Fluids Systems Equipment

Specialty drilling fluids systems equipment is typically required for a relief well operation. This may include mud cleaners, high capacity centrifuges, fluids mixing and storage tanks, low restriction flow lines, effective degassers, high volume transfer pumps, and possible flow drilling capabilities.

- Derrick Equipment 281-590-3003
- Baroid-Halliburton 281-575-3000
- Schlumberger 281-285-1300
- Brandt-NOV 713-375-3700
- MI Swaco 713-375-3494

3.20 Specialty Fluids, Chemicals, and Additives

Some drilling operations may utilize some type of specialty fluids, chemicals, or additives to maximize effectiveness. These fluid components can include blocking agents, fluid loss additives, viscosifiers, borehole stabilizers, polymers, acids, weighted brines and muds, exotic heavy weighting agents, friction reducers, and plugging materials. Most of these materials are available through drilling fluids service companies.

- Baroid-Halliburton 281-575-3000
- Drilling Specialties 823-813-4100
- MI Swaco-Alpine 713-375-3494
- Schlumberger 281-285-1300
- Sun Drilling Products 504-393-2778

3.21 Mud Storage Equipment

Kill operations may require substantial amounts of kill fluids, including specialty fluids and materials. Storage tanks and vessels must be accessible for wellhead hookup, transferring, and transportation of fluids. Land locations typically do not present storage problems. Kill fluid mixing capability and equipment is imperative for all locations, especially heavy-weighted fluids. Logistics of kill fluid mixing, transferring, and deliverability to the pumping plant are vital to the kill operation. The tank and vessel required can be obtained from drilling contractors, pumping services companies, and/or oilfield rental vendors.

- Utilize Halcón Resources Preferred Vendor

3.22 Seismic Services

Following a well control event, shallow charging of formations can become pressured from the upward flow of blowout fluids. Underground flow into recipient zones and/or flow from previously normal stratum can present complications during relief well drilling, final capping, and snubbing operations. Local vendors should be investigated.

- Veritas DGC, Inc. 832-351-8300
- Western Geco-Schlumberger 281-285-1300
- Baker Atlas 713-439-8600

3.23 Heavy Lift and Civil Works Equipment

Halcón Resources Site Construction Group

3.24 Specialized Computer and Software Services

Computer software and service is required to assist with analysis and interpretation of all phases of the project. Types of software typically include hydraulic simulators, well control simulators, 3-D directional drilling computations, well log interpreters, gas plume, oil spill containment, heat and flare radiation, toxic gas dispersion, and drilling engineering. Most of these packages are available through small companies offering highly specialized services.

- Boots & Coots 281-931-8884 **24-Hour Response Hotline**
- Well Flow Dynamics/Ad Energy 47 66 98 32 90

3.25 Safety, Health, and Toxic Gas Detection Services and Equipment

Safety and health services are critical during all phases of the event response. Many services are required throughout the project, including emergency medical and evacuation, personnel safety equipment suppliers, and operations site safety auditor services. Some blowouts may contain toxic gases, for example H_2S, and present operational complications during well capping, relief well rig location selection, or snubbing. Services which provide detection, safety procedures, medical aid, and remediation, for personnel and operational equipment are required.

- Boots & Coots 281-931-8884 **24-Hour Response Hotline**
- HSE Integrated 403-266-1833
- Key Safety Services, Inc. 403-887-1111

3.26 Communication Equipment and Services

Effective communications play a vital role during any project, and are especially important during a well control event. A communications system containing several 24-hour telephone, facsimile, telex, radio lines, and communication centers is recommended. Also, a dedicated satellite communication network for international direct dialing provides reliability and quick access for immediate response. A complete communications network plan must be researched, implemented, and a person dedicated to this crucial support service.

3.27 Reservoir and Petro Physics Specialist

In order to completely evaluate and analyze a well control event, experts in reservoir engineering and petro physics are required. Definition of the blowout rate, fluids composition and analysis, source and thief zones, wellbore stability characteristics, reservoir and drawdown properties, flow regimens, and production potential are required. Some of these experts may be available within the corporate structure.

3.28 Environmental Engineering and Equipment Specialist

Protection of the environment should be among the primary concerns of the well control event. Environmental engineering services for spill assessment and cleanup, regulatory compliance at new and existing sites, and final site remediation are typically required. Experts familiar with current regulation, remediation technology, and petrochemical discharge are minimum prerequisites.

- Reference ‘Spill Response Plan’ in the ERP.

3.29 Risk Assessment Specialist

One critical area of investigation during the initial phases of an intervention project is the assessment of risk involved within the operations. Experts are required who have understanding of high profile decision tree analysis, risk assessment of emergency events, risk analysis simulation techniques, advanced probability and statists, and consequence modeling.

- Boots & Coots 281-931-8884 **24-Hour Response Hotline**

3.30 Technical Audit and Documentation Specialist

During the project, a comprehensive set of audit and documentation procedures should be implemented to record the event for legal, historical, and analytical purposes. A dedicated person or group should be made available to record meetings, to compile and assemble data, and to organize the data housing (file) of the various documents. This function should be delegated to a person or group whose sole responsibility is maintaining the project records.

4 Halcón Resources List of Preferred Contractors

Please refer to the most current list located at Halcón Resources office. To get a new updated list contact the Halcón Resources EHS Department.

5 Checklist Equipment and Material for Well Control Event

5.1 Specialized Firefighting Equipment

Quantity Mobilized		Description
2	_____	Fire pumps, minimum 4,000 gpm @ 150 psi
1	_____	Athey Wagon and Boom Assembly
1	_____	Venturi Tube for Athey wagon
1	_____	Rake assembly for Athey Wagon
1	_____	Stinger assembly, complete w/ stinger and fittings
1	_____	Piperack, complete with suction & discharge hoses, water monitors, pipe nipples, fittings, butterfly valves, flanges, hammer unions, aluminum pipe, high temperature cloth, etc. necessary in rigging up fire pumps
1	_____	Job Box, complete with hand tools, hammer wrenches, brass hammers, air impact wrenches w/ sockets, pipe wrenches, air grinders, etc.
30	_____	4” x 20’ aluminum pipe w/ indusco fittings
4	_____	8” x 20’ oil, suction and discharge hose complete with figure 100 hammer union
12	_____	4” x 10’ discharge hose complete w/ fig. 100 hammer Union
6	_____	4” x 10’ discharge hose complete w/ fig. 100 hammer union/ male aluminum adapter
6	_____	4” x 10’ discharge hose complete w/ fig. 100 hammer union/ female aluminum adapter
2	_____	4” Stang monitors complete w/ nozzle & base

1	_____	2”- 5” Porta-Lathe cutter
1	_____	3”- 6” Porta-Lathe cutter
1	_____	6”- 9” Porta-Lathe cutter
1	_____	9”- 14” Porta-Lathe cutter
1	_____	14”- 16” Porta-Lathe cutter
1	_____	18”-20” Porta-lathe cutter
1 lot	_____	miscellaneous spare parts for Porta-Lathe cutter
20	_____	Double edge cutter blades for Porta-Lathe cutter
1	_____	Halliburton Abrasive Jet Cutter with Sack Abrasive
	_____	Spare parts for fire pumps
1	_____	Junk shot Manifold complete w/ rope, rubber, steel balls, golf balls & other plugging material

5.2 Heavy Equipment

1-min.	_____	D-8 or D-9 Caterpillar bulldozer w/ Hydraulic driven winch
4-min.	_____	D-8 or D-9 Caterpillar bulldozer w/ Rippers
1	_____	Front end loader, large capacity rough-terrain
1	_____	Forklift, large capacity rough terrain
1	_____	Track hoe, 235 Caterpillar or equivalent
1	_____	150 ton Crawler crane w/ minimum of 100' boom (capping crane)
2-min. equipment)	_____	40 – 60 ton hydraulic crane (for rigging up firefighting
1-min.	_____	Tandem Rig up Truck/ Pole Truck
	_____	Vacuum trucks (for hauling firewater or discharge from well)
1	_____	Refueling/Lube truck (for refueling heavy equipment, fire pumps)
1-min	_____	Road grader, Maintainer

ALL EQUIPMENT TO BE PROVIDED WITH A QUALIFIED OPERATOR

5.3 Rental Equipment

1	_____	185 cfm air compressor
4	_____	Light plants, trailer mounted
1	_____	Generator
2	_____	Pressure washers
	_____	4 wheelers, Kawasaki mules or alternative all terrain vehicles

5.4 Metal For Fabricating Support Equipment

250-sheets	_____	3’ x 8’ sheets corrugated tin
1000-ft .	_____	Large diameter pipe for fire water supply line (12”-16”)
1-sheet	_____	2” steel plate
2-sheets	_____	1” steel plate
2-sheets	_____	½” –5/8” steel plate
1,500-ft.	_____	2” x 2” x ¼” angle iron (Heat shields for bulldozers)
50-sheet	_____	3/16” or ¼” diamond plate, expanded metal or floor grating (flooring for monitor sheds, cutting sheds, etc.)
2,000-ft.	_____	2 3/8” or 2 7/8” junk tubing (structural for building monitor sheds, sheds, and heat shield)
1-lot	_____	Casing for diverter lines

5.5 General Oilfield Supplies

6	_____	8” Figure 100 hammer unions
6	_____	6” figure 100 hammer unions
12	_____	4” figure 100 hammer unions
6	_____	8” x12” pipe nipples, threaded both ends & collars
12	_____	6” x 12” pipe nipples, threaded both ends & collars
12	_____	4” x 12” pipe nipples, threaded both ends & collars
6	_____	4”wafer type butterfly valves
12	_____	4” 150# R.F. threaded flange
50	_____	5/8” x 6 ¼” studs w/ nuts both ends
10-rolls	_____	tie wire
20	_____	3/8” x 15’ high test chain w/ grab hooks (Crosby Brand & Load Binders)
40	_____	2” shackles, pinned
40	_____	1 ¾” shackles, pinned
40	_____	1 ½” shackles, pinned
40	_____	1 ¼” shackles, pinned
40	_____	1” shackles, pinned
40	_____	¾” shackles, pinned
1-roll	_____	½” manila rope
1-roll	_____	¾” manila rope
4	_____	200-psi liquid filled gauges
4	_____	600-psi liquid filled gauges
4	_____	1,000-psi liquid filled gauges
4	_____	3,000-psi liquid filled gauges
4	_____	5,000-psi liquid filled gauges

4	_____	10,000-psi liquid filled gauges
2-boxes	_____	shop rags, Cotton Only (No Synthetic)
2	_____	Snatch blocks for 1 1/8” cable, shackled not hooked
25	_____	Heavy duty boards (to support pumps on water levy, scaffolding, etc.)
	_____	Structural lumber (2 x 4’s) for heat shields, road blocks, etc.
1	_____	Awning

5.6 Specialized Oilfield Supplies

1	_____	Pit liner for water pits
10-min.	_____	Frac tanks for fire water or mud supply
2	_____	500 ton travelling blocks (Used for rig removal)
2	_____	large volume diesel driven water transfer pumps (3000 gpm minimum)
2	_____	Mud charging pumps (to feed pump truck from frac tanks)
1	_____	Mud system, complete with mixing and circulating capabilities
	_____	Board mats
1,000-ft.	_____	High Pressure tubing, for pumping or cutting operation (to maintain good distance between well and pump trucks) size to be determined per requirement
20	_____	6” or 8” Drill Collars (Dead man to skid rig)
1	_____	Coil Tubing unit
1	_____	Snubbing unit

5.7 Explosives and Associated Supplies

1,000-lbs.	_____	Explosives, 90-100%, general oilfield type
	_____	Dry chemical
	_____	Blasting caps for explosives
4	_____	55 gallon drums
2,000-ft.	_____	14 gauge wire, 2 wire minimum

5.8 Cables, Slings And Clamps

2,000-ft.	_____	1 1/8” 6 x 36-softlay cable (for rig removal)
1,000-ft	_____	¾” 6 x 36-softlay cable (slings for debris removal)
1,000-ft.	_____	5/8” 6 x 36-softlay cable (slings for debris removal)
100	_____	1 1/8” cable clamps
100	_____	¾” cable clamps
100	_____	5/8” cable clamps
10	_____	1 ½” x 10’ wire rope slings, 6 x 36 soft lay cable
20	_____	1 ¼ x 10’ wire rope slings, 6 x 36 soft lay cable
20	_____	1 ¼” x 20’ wire rope slings, 6 x 36 soft lay cable
20	_____	1” x 10’ wire rope slings, 6 x 36 soft lay cable
20	_____	1” x 20’ wire rope slings, 6 x 36 soft lay cable
40	_____	¾” x 10’ wire rope slings, 6 x 36 soft lay cable
40	_____	¾” x 20’ wire rope slings, 6 x 36 soft lay cable
40	_____	5/8” x 10’ wire rope slings, 6 x 36 soft lay cable
40	_____	5/8” x 20’ wire rope slings, 6 x 36 soft lay cable

5.9 Welders and Associated Equipment

6	_____	Structural welders with helper and equipment
1	_____	Certified Welder with Helper and equipment
4	_____	Cutting torch complete with large supply of oxygen, acetylene and accessories, 250 ft. of hose per torch, strikers, tip cleaners and spare tips
2	_____	long reach cutting torch, complete with large supply of oxygen, acetylene and accessories, 250 ft. of hose per torch, strikers, tip cleaners and spare tips

5.10 Miscellaneous Considerations

_____	Water source
_____	Pipeline or alternative method of transporting water to pits
_____	Transportation for work force, firefighting crew
_____	Gravel, Fill dirt

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Appendix A Well Control Equipment and Services

Contents

A.1 Introduction

The following information sheets contain specific data regarding well control event mitigation and intervention for the Halcón Resources operations in the Woodbine region.

These sheets are intended to accomplish the following.

- Provide Halcón Resources with a pre-event assessment of the hurdles specific to well control intervention for each operational area.
- Illustrate the different well control intervention risks involved for the different operational areas.
- Provide Halcón Resources with a tool that can be used in development activities to design proper 'cost of control' well control coverage.
- Provide Halcón Resources with a tool to use when working with local government agencies as a part of the company's overall well control emergency preparedness.
- Provide Halcón Resources with information that can be used to draft response to local officials and the media during a well control event.

The information in these data sheets was developed using information regarding the specifics of each operational area in conjunction with experience in handling major well control events.

Woodbine Information Sheet

Category	Item	Impact	Comments
Logistics	**Equipment**	**Minor**	Boots and Coots rapid response package consists of fire pumps etc. staged in Houston, TX. This equipment can be dispatched based on availability as soon as notification is made. Additional equipment can be dispatched from Houston, TX.
	Personnel	**Minor**	Boots and Coots has experienced first responders in Houston. These responders can respond to any emergency and do an assessment. Based on that assessment, additional resources can be dispatched to location.
Infrastructure	**Media**	**Moderate**	The involvement of media is going to be moderate. In case of a well control event, it is recommended to have a designate point of media contact from Halcón Resources at or near the site during the intervention operations.
	Government	**Moderately High**	The Texas State Government closely monitors oil and gas activities in the state. Therefore, the government involvement in the intervention is expected to be moderately high. It is recommended that the appropriate agencies be informed of a well control situation as soon as possible and be kept updated with the progress of the operations.
	Local Population	**Moderate**	The local population impact will be moderate as there is some population within 1.2 miles of the location. However, depending on the wind and the weather conditions, there can be some impact on population. Halcón Resources should work with local law enforcement officials to ensure proper safety of the population surrounding the location.
	Environmental Concerns	**Major**	The sensitivity to environmental concerns is high. Extreme caution is required in such regions. The gently rolling topography may require that earth works construction be undertaken to control the drainage of firefighting water. These activities can lengthen the time of the intervention.
	Communication	**Moderately High**	Certain areas in this region have poor cell phone reception. A good communication network is one of the key things required for efficient well control intervention activities. Communication is required for ordering equipment and personnel, informing the regulatory agencies and reporting to keep Halcón Resources informed about the operations. A good line of communication will need to be established early in a major well control event.

Woodbine Information Sheet			
Accessibility	**Weather**	**Moderate**	Location accessibility will be a moderate hurdle in the intervention operations. Location accessibility may be hampered by weather.
	Location	**Major**	Pad locations may cause major difficulties during the intervention depending on the circumstances.
Oilfield Supply	**Water**	**Major**	Water will have to be hauled in and stored in frac tanks. This can take at least 2 days depending on the weather and the availability before water cover can be sprayed. Surface water is available and can be used. But the location of 'withdrawal point' can delay availability.
	Earth Moving Equipment	**Moderate**	Bulldozers and excavators may be required for earth works and pollution control. Equipment may not be as readily available as oilfield operations are relatively numerous in this region.
Blowout Intervention	**Well Pressure**	**Moderate**	Slightly above normal pressure.
	Well Architecture	**Moderate**	Horizontal wells with conventional architecture.
	Blowout Flow Rate	**Moderate**	Horizontal gas wells. Blowout flow rate may be relatively high for gas wells.
	Rig and Debris Removal	**Moderate**	Weather may delay rig removal process.
	Capping and Wellhead	**Minor**	Conventional wellhead arrangement.
	Well Kill	**Minor**	Conventional fluids and well architecture.

A.2 Equipment and Service Considerations

Following is a list of equipment and services that could be required for a well control event. The specific list for a given event will be determined as required. Halcón Resources will be able to source most of this equipment locally and Boots and Coots can supply and/or source specialized oil well firefighting and capping equipment. All of this equipment and the services are common to the oil field and should be readily available in the immediate area. This list is not conclusive and will need to be changed for different well control events.

A.2.1 Construction Equipment

Most of the following equipment is considered standard construction equipment that is routinely used in the oil field to perform such task as location construction. Many of the auxiliary items are available through either oilfield construction contractors or specialty tool vendors.

A.2.2 Bulldozer

Caterpillar model D8 or D9 is the most common size of bulldozer that may be needed for well control operations. This equipment is required for debris removal, location preparation, and for the operation of an Athey Wagon. The tractors used for the operating the Athey Wagon will need to be equipped with a tail winch package with $^{7}/_{8}$" wire rope in good condition. (Typical Requirement: 1 to 3)

A.2.3 Excavators

A Caterpillar 200 series track mounted excavator may be required for a variety of excavation activities around the wellhead during the surface intervention operation. Rubber tired backhoes are commonly required to perform small scale excavation projects during the well control operation. (Typical Requirement: 1 to 2)

A.2.4 Cranes

Lattice boom and hydraulic boom cranes will be used for a variety of activities ranging from unloading equipment to capping operations. Many times a lattice boom crawler style crane is the best choice for capping operations when available. The capacity of the cranes can range up from a minimum of 75 to 100 ton. (Typical Requirements: 1 to 2)

A.2.5 Forklifts

Forklifts are usually needed to facilitate material handling and equipment movement on location. A Caterpillar IT series articulating style forklift is typically used. (Typical Requirements: 1 to 2)

A.2.6 Fabrication Personnel and Material

Skilled field welders may be required to perform a variety of fabrication projects during the length of the surface intervention campaign. Each individual contractor should be able to supply the tools common to field fabrication projects regularly performed in the oil field. Some of these items include a portable welding machine, cutting torch, and electric grinder. A list of materials will be supplied for specific construction projects. Commonly needed materials are angle iron, tubing, sucker rods, and corrugated sheet metal. Safety equipment required by the personnel performing the fabrication will be goggles and face shields.

A.2.7 Roustabouts

A crew of roustabouts may be needed to help with the assembly of the well control firefighting equipment and the various fabrication projects. A supervisor with five roustabouts and a well-equipped gang truck will need to be employed.

A.2.8 Air Compressor

A mobile type air compressor capable of delivering 185 cfm at 120 psi may be needed for many activities during the well control event. Some of these will include starting the firefighting pumps, operating dry prime systems and other various pneumatic tools. Specialty rental tool suppliers can typically supply these type air compressors and accompanying sections of 1" air hose.

A.2.9 Light Towers

Diesel powered mobile light plants may be required to help support different activities conducted at night. Operations on a blowout well are not conducted at night, but many fabrication projects can be safely conducted at night. The light towers will be required to ensure this work can be conducted in a safe manner. The light towers are also available through a specialty rental tool company.

A.2.10 Trash Pumps

Pneumatically operated diaphragm pumps may be used to transfer a variety of fluids that may contain large solids. These pumps may be required to help keep cellars clear of various fluids during the capping operation. The most used size is 3" and can be sourced from specialty rental tool suppliers.

A.2.11 Pneumatic Tools

The flammable environments well control operations are often conducted in require powered tools to be pneumatically operated. The tools can include impact wrenches, drills, and hacksaws available from construction companies or supply stores.

A.2.12 Pneumatic Winches

Large pneumatic winches ‘tuggers’ are used in debris removal and in capping operations. These type winches can usually be available from a drilling contractor.

A.3 Special Well Control Equipment

A.3.1 Surface Wellhead Equipment

Blowouts, especially those that result in a fire, require the wellhead be replaced before a capping operation is conducted. The need to replace the wellhead can be required for several reasons ranging from the effects of falling debris physically damaging the wellhead structure or heat damage to the sealing elements of the wellhead. Some wellhead types or configurations can make capping operations difficult and needed to be changed due to this fact. Some of these can be unitized wellheads, clamped flanges, and studded flanges.

The wellheads typically used are Braden head style slip and flange body assemblies which incorporate mechanical slips with a manually energized sealing system. This wellhead is usually installed on the inner most string after the original wellhead has been removed and all the outer strings have been cut and stripped away. After the new wellhead has been placed over the inner string of casing the slips are then installed and two hydraulic jacks are used in conjunction with a dual clamping system to engage the slips and secure the wellhead assembly. Boots and Coots can supply the equipment to install this wellhead system and can help source the proper wellhead for this operation. This operation should only be attempted by experienced well control specialist such as Boots and Coots.

A.3.2 Venturi Tube

A Venturi tube is constructed from a large diameter piece of pipe, typically 20' to 40' in length. The diameter is dependent on the size of the blowout with $13^{3}/_{8}$" or 20" casing as typical sizes. The venture tube is placed over a blowout to elevate the exit point of the blowout a safe distance above the personnel and equipment working on the blowout well. These tubes have also been used as a means to inject nitrogen or water into the flow stream to extinguish a fire.

A.3.3 Surface Equipment

If the well control operation will require that a capping operation be used to control the blowout many different types of surface equipment may be required. This list can include BOPs, hydraulic chokes, choke manifolds, manual gate valves, HCR valves, plug valves, squeeze manifolds, accumulator closing units, swivel joint steel hose assemblies, etc. Since the condition of this equipment to perform correctly in extremely difficult situations, it is paramount the equipment be in the very best condition possible. Usually well control specialists depend on very reliable sources for this type of equipment.

A.3.4 Firefighting Equipment

Oil well firefighting equipment may be required for any surface blowout. The equipment comprising an oil well firefighting system consists of large capacity non-positive displacement pumping equipment. The capacity of the Boots and Coots firefighting pumps ranges from 2,000 to 5,000 gpm per pump at an average pressure of 100 psi. The nozzles used with the firefighting system have a capacity of spraying 1,000 gpm and several can be required for a blowout. In most cases this equipment capacity exceeds that of local fire departments.

The entire firefighting system is often comprised of tandem pumping units, large diameter hoses, firefighting monitors and nozzles, monitor stands, foam delivery systems, and various manifolds, etc. All this equipment is readily available from Boots and Coots. Although, it is sometimes necessary, depending on the specific situation, special equipment is fabricated on location to support a safe and expeditious firefighting effort.

A.3.5 Athey Wagon

An Athey Wagon is a 60' boom assembly that is attached to a track mounted carriage connected to a bulldozer. The operation of the boom is controlled by the tail winch on a bulldozer and the Athey Wagon is manipulated on the location with the bulldozer.

This assembly is used to convey different implements on the end of the boom assembly into a fire or blowout to help remove debris from the wellhead area. The boom assembly has to be protected with a firefighting spray to protect itself while working on a blowout which has resulted in a fire.

A.3.6 Hydraulic Athey Wagon

Similar in appearance to an Athey Wagon, the Hydraulic Athey Wagon has a hydraulically operated 40 ft boom section mounted on a large tracked carriage. This Athey Wagon is primarily used for capping operations when a well must be capped without extinguishing the fire. The two most common occurrences for this type of operation are when a blowout and fire is experienced while drilling an H_2S well or when extinguishing the fire would cause an extreme environmental hazard.

The Hydraulic Athey Wagon has the capability to hoist a large bore capping stack, transport it to the wellhead and cap the well. The vertical motion of the boom is provided by a hydraulic winch attached to the carriage and controlled by a hydraulic power unit. The Hydraulic Athey Wagon is manipulated on the location with a bulldozer.

A.3.7 Coiled Tubing

During the recovery phase, often following the capping operation, coiled tubing units are commonly used as a live well intervention tool to regain control of the well. These units can use tubing sizes ranging from $^1/_2$" to $3^1/_2$" diameter with operating pressures from 5,000 to 15,000 psi. Coiled tubing can be used to convey a wide range of thru-tubing tools to perform several intervention operations. Often the demand of the job to be performed will determine the proper size and type of unit required. This type of equipment is available from Boots and Coots.

A.3.8 Snubbing Equipment

Many times a snubbing unit may be required to perform the well recovery phase of a well control event. A snubbing unit is a live well intervention tool that allows running jointed tubular goods in a live well. Two types of snubbing units are typically used today and they are hydraulic rig assist and hydraulic standalone units.

The rig assist unit is used in conjunction with a drilling or service rig. The rig is used to run the pipe in the well in the 'heavy' condition and the snubbing unit is used for the pipe 'light' condition. The rig assist units typically have a passive rotary ability, therefore they require a power swivel to rotate the string. The standalone hydraulic snubbing units have the capability to run pipe in the 'heavy' or 'light' conditions. These type units have powered rotary tables for string rotation. The main performance differences are the rig assist units have quicker tripping speeds, but the stand alone units are better equipped for higher pressure operations that will yield increased snub loads.

All snubbing units are rated by hook load capacity. The rig assist units are typically 120K to 170K with $7^{1}/_{16}$" through bores. The hydraulic units come in many different sizes ranging from 150K for thru-tubing operations to 600K for drill pipe and casing operations. The bore of these units can range from $4^{1}/_{16}$" to $13^{5}/_{8}$". This type of equipment is available from Boots and Coots.

A.3.9 Hydraulic Tongs

The hydraulic tongs that will be need for a snubbing operation involves drill pipe or drill collars and will need high torque capabilities. These style tongs differ from regular casing tongs which have a hydraulic backup integral to the tong itself. These tongs can be sourced from specialty tong service vendors.

A.3.10 Hydraulic Tools

Hydraulically operated tools such as torque wrenches, nut splitters, and jacks may be required for various tasks during the event. These items can be supplied from pressure testing companies and specialty rental services.

A.3.11 Hot Tapping and Valve Drilling Equipment

Hot tap and valve drilling equipment may be needed to gain access to tubular products or a failed valve assembly. The hot tap equipment is used to drill a hole in tubular products and the valve drilling unit is used for drilling out a failed gate valve. This equipment is readily available for operations to 15,000 psi in H_2S environments.

A.3.12 Mud Mixing Equipment

A complete mixing system may be needed for preparing fluids for kill operations. This may include mud tanks that can be recirculated, mixing equipment, bulk storage equipment, and material handling equipment.

A.3.13 Abrasive Jet Cutters

High pressure cutting equipment may be needed for removal of debris and wellhead equipment during a well control event. This equipment is designed to be used in the harsh environments frequent to surface intervention projects. Boots and Coots can supply these cutting systems as required.

A.3.14 Proximity Ranging Equipment

During relief well operations it may be necessary to use magnetic ranging tools to find the bottom hole location of the blowout well to assist with the intercept. Most vendors provide these type tools and service. Boots and Coots will assist in obtaining this service when required.

A.3.15 Breathing Equipment

If toxic gas is present it will be necessary for all personnel working on the location to use self-contained breathing apparatus (SCBA). This equipment is typically provided from a local safety company. They will be able to provide 5 min escape units, 30 min work units, cascade systems, and any needed monitoring equipment.

A.3.16 Lathe Cutters

Portable lathe cutters may be required to make precision cuts. This is the usual equipment used to make the final cut on the inner most casing string before a new wellhead is installed. This equipment can be pneumatically or hydraulically operated depending on the specific task to be performed. This equipment is available from Boots and Coots or a specialty rental tool supplier.

A.3.17 Freeze Equipment

Two types of freeze services are routinely performed in the oilfield, they are dry ice and cryogenic freeze operations. The dry ice freeze requires a box or an open top container be constructed around the objective to be frozen. A column of fresh water bentonite gel is pumped in the well and crushed dry ice is placed in the container around the item to be frozen. Methanol is then added to the crushed dry ice. The cryogenic freeze uses the same gel mixture, but copper coils are wrapped around the item to be frozen and nitrogen is circulated through the copper tubing.

The dry ice method is normally used on irregular shaped items such as wellheads and the cryogenic freeze is used on tubular products. Boots and Coots has extensive experience in both of these processes.

A.3.18 Other Specialized Equipment

The list of specialty equipment required for a well control event can be very extensive and will be different for specific situations. Some of these items can be windows for coiled tubing or snubbing operations, slip rams, punch rams, blind/shear rams, profile nipples, ported hang-off subs, hoisting blocks, and various cable and clamp requirements. Boots and Coots will be able to make recommendations for the equipment needed during a specific operation and can help source equipment as required.

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Appendix B Well Control Data Sheet

Contents

B.1 General Information

Date:_____ Time:_____

B.2 Operator Information

Company:_____ Company Contact:_____

Phone Number:_____ Email:_____

Contractor:_____ Rig Name/No:_____

Rig Type:_____ Phone Number On Location:_____

B.3 Well Information

Well Name:_____

Lease Name:_____

Latitude/Longitude:_____

Closest Town/City:_____ Miles From:_____

Directions/Dock:_____

Closest Airport:_____ Runway Length:_____

Water Depth:_____

Underground Blowout:_____ Surface Blowout:_____

Fire:_____ H_2S:_____

B.4 Well Bore Information

MD:_____ TVD:_____ Horizontal Section:_____ Bit Depth:_____

Relief Well Location Availability:_____ Closest Well:_____

1st DP Size:_____ Weight:_____ Grade:_____ Length:_____

2nd DP Size:_____ Weight:_____ Grade:_____ Length:_____

3rd DP Size:_____ Weight:_____ Grade:_____ Length:_____

DC Size:_____ Weight:_____ Length:_____

SIDPP:_____ SICP:_____ MW:_____ Influx Size:_____

Float@:_____

1st TBG Size:_____ Weight:_____ Grade:_____ Length:_____

2nd TBG Size:_____ Weight:_____ Grade:_____ Length:_____

3rd TBG Size:_____ Weight:_____ Grade:_____ Length:_____

Packer:_____ Type:_____ Size:_____ Depth:_____

SITP:_____ SICP:_____

B.5 Casing String Information

Surface Casing:_____ #Burst:_____ Collapse:_____

OD Size:_____ Weight:_____ Grade:_____

Connection:_____ LOT or FIT:_____

Intermediate:_____ #Burst:_____ Collapse:_____

OD Size:_____ Weight:_____ Grade:_____

Connection:_____ LOT or FIT:_____

Long String:_____ #Burst:_____ Collapse:_____

OD Size:_____ Weight:_____ Grade:_____

Connection:_____ LOT or FIT:_____

Tie Back/Liner:_____ #Burst:_____ Collapse:_____

OD Size:_____ Weight:_____ Grade:_____

Connection:_____ LOT or FIT:_____

Production:_____ #Burst:_____ Collapse:_____

B.6 Casing String Sketch

B.7 BOP Information

Rotating Head Type:_____ Size:_____ Pressure Rating:_____

Annular Type:_____ Size:_____ Pressure Rating:_____

Top Ram Type:_____ Size:_____ Pressure Rating:_____

Middle Ram Type:_____ Size:_____ Pressure Rating:_____

Lower Ram Type:_____ Size:_____ Pressure Rating:_____

Wear Busing Type:_____ Size:_____

B.8 BOP Sketch

B.9 Wellhead Configuration

A Section

Type/Size/Rating:_____

Valve:_____

Sweet/Sour Service:_____

B Section

Type/Size/Rating:_____

Flange:_____

Sweet/Sour Service:_____

C Section

Type/Size/Rating:_____

Flange:_____

Sweet/Sour Service:_____

Tree

Type/Size/Rating:_____

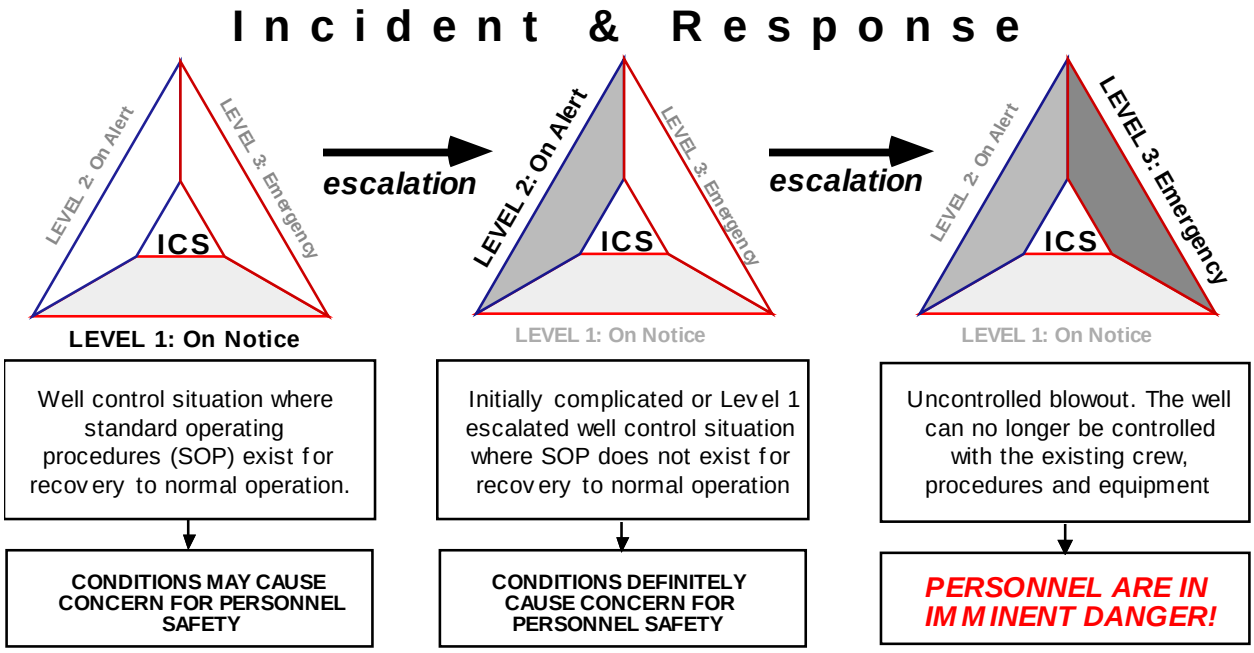
Flange:_____

Sweet/Sour Service:_____

Appendix C Incident Assessment

Contents

C.1 Incident Assessment



C.2 Initial Site Assessment Checklist

An initial evaluation by blowout control specialist and Halcón Resources and contractor personnel will determine the course of action that will result in well control being regained safely in a minimum amount of time. A brief report will be issued documenting the findings of the assessment.

- ❑ Assess and define methods of assessment- Initial assessment will be made by helicopter. Secondary assessment will require a closer evaluation by blowout control specialist if the risk to responders is acceptable.
- ❑ Define assessment team. The team should be no larger than necessary and will include blowout control specialist and depending on circumstances key Halcón Resources personnel that may be required to guide the blowout control specialist and/or activate machinery.

The assessment may be done in two or three stages. Initially two specialists with a pre-defined route and later with support staff from Halcón Resources once the risk has been assessed.

- Re-assess the potential safety hazards for the assessment team, (e.g., If on fire-firewater protection, secondary explosion hazards, shifting winds, falling debris. If not on fire- ignition hazards, pool fires, fire and explosion effects, lack of oxygen, changes with wind velocity or direction, structural collapse, falling debris, responders slip and falling, broaching, rapid and unexpected blowout escalation, radiation sources, high noise levels, etc. Confirm heat radiation, LEL and/or H_2S values if meters are available, attach sketch of hot and exclusion zone). Include 3rd party experts and/or Halcón Resources risk personnel in the assessment. Assess each person in the assessment team to determine if they are absolutely necessary. Use two person work teams-'Buddy System'.
- Assess requirements for personal protection equipment (PPE), (e.g., fire resistant clothes, bunker gear, SCBA, heat shields, blast shields, fire water, foam, access and egress, rescue, etc.).
- How will the assessment team communicate to their support group?
- How will the assessment team gain access to Rig?
- Define the route the assessment team will take for their assessment.
- Define the time period the assessment team will be on location.
- Define escape routes and procedures should escalation or ignition occur while on board/site.
- Define the objectives of the team.
- Description of the blowout, its exit path and flow conditions.

- ❑ Surface blowout well is on fire: Describe exit point(s), size of fire, direction, attach pictures, reference video, etc.
- ❑ Surface blowout well not on fire: Describe exit point(s), flow column size, diameter, height, length, flow bell shaped, size of gas cloud
- ❑ Describe observations on the type and relative volumes (or ratios) of the blowout effluent: (e.g., oil, gas, GOR and water). Is the flow constant, increasing, decreasing, slugging water or oil occasionally, variable (increasing and decreasing)?
- ❑ What are the apparent structural integrity of the asset and potential for further deterioration?
- ❑ What is the observed condition of the diverter, choke and kill lines and manifold, control lines, drillpipe, derrick, drilling package, power, etc.?
- ❑ Describe the lateral and overhead access to the well area, amount of debris to be removed
- ❑ Can the rig power generators be restarted?

- ❑ Take photographs and video (make sure they do not produce an ignition risk)
  - o Take into consideration of Social Media Risk
- ❑ Draining of pollution control traps and fuel tanks
- ❑ Isolation of pipelines
- ❑ Shut-in of adjacent wells
- ❑ Assess external tie-ins for hydraulic, water or power
  - o Assess risk to surface control capping team
  - o If not on fire, apparent ignition risks (fire and explosion hazards)
    - ▪ Enclosed spaces to trap vapors (explosion risk and flying debris hazard)
    - ▪ Pooled liquid hydrocarbons (ability to drain)
    - ▪ Flammability of the hydrocarbons mixture (related to GOR and mole composition).
    - ▪ Ignition sources, static electricity, hydrocarbon impingement against metal, sand production
    - ▪ Considerations for H_2S should be evaluated
  - o If on fire
    - ▪ Heat loading on personnel and structure, potential for structural collapse
    - ▪ Escalation of fire by erosion of exit point
    - ▪ Secondary fire and explosions (pool fires of unburned liquid hydrocarbon, fuel tanks, trapped air fuel mixtures)
    - ▪ Changing fire direction by sudden collapse of overhead structures, erosion or tubular failure, wind changes
    - ▪ Heavy smoke making visibility difficult
  - o Mitigation of risk to acceptable levels
    - ▪ Firewater and foam protection for personnel and structure
    - ▪ Ability to remove debris
    - ▪ Escape possibilities if escalation occurs
    - ▪ Ability to extinguish fire if desired
  - o Proceed with plans
- ❑ Develop an Incident Action Plan (IAP) for work to be performed over the next 24 hours.
- ❑ Evaluate personnel and equipment requirements for the next 24 hours (e.g., crane, welding and fabrication personnel and equipment, fire-pumps, etc.)
- ❑ Evaluate current logistics for longer lead personnel and equipment requirements based on assessment (fire-pumps, monitors, jet cutter, capping stack, Koomey unit, choke manifolds, diverter lines, snubbing unit, stimulation unit, high pressure pumps, mud storage, etc.)

Appendix D Site Safety / Site Control

Contents

D.1 Introduction to Site Safety Plan/Site Control

If a severe well control incident occurs, the On-Scene Commander, HSE and Well Control Specialist (if available) will develop a Site Safety Plan and enforce it immediately, and submit it to the Incident Commander. The plan will identify the hazards present on site and will define Site Control boundaries, including SAFE AREA and HOT ZONE boundaries, and control access to the incident site. In a well control incident, the main hazards are heat, noise and explosion. Common hazards to health and safety on a blowout include:

- Radiant Heat
- Explosive and/or toxic gas concentrations
- Explosive materials (perforating charges, prima cord, etc.)
- Compressed substances (acetylene, oxygen, aerosols, etc.)
- Hazardous chemicals
- Dangerous noise levels
- Structural damage
- Leaking gas or fluids

D.2 Establishing a Site Safety Plan

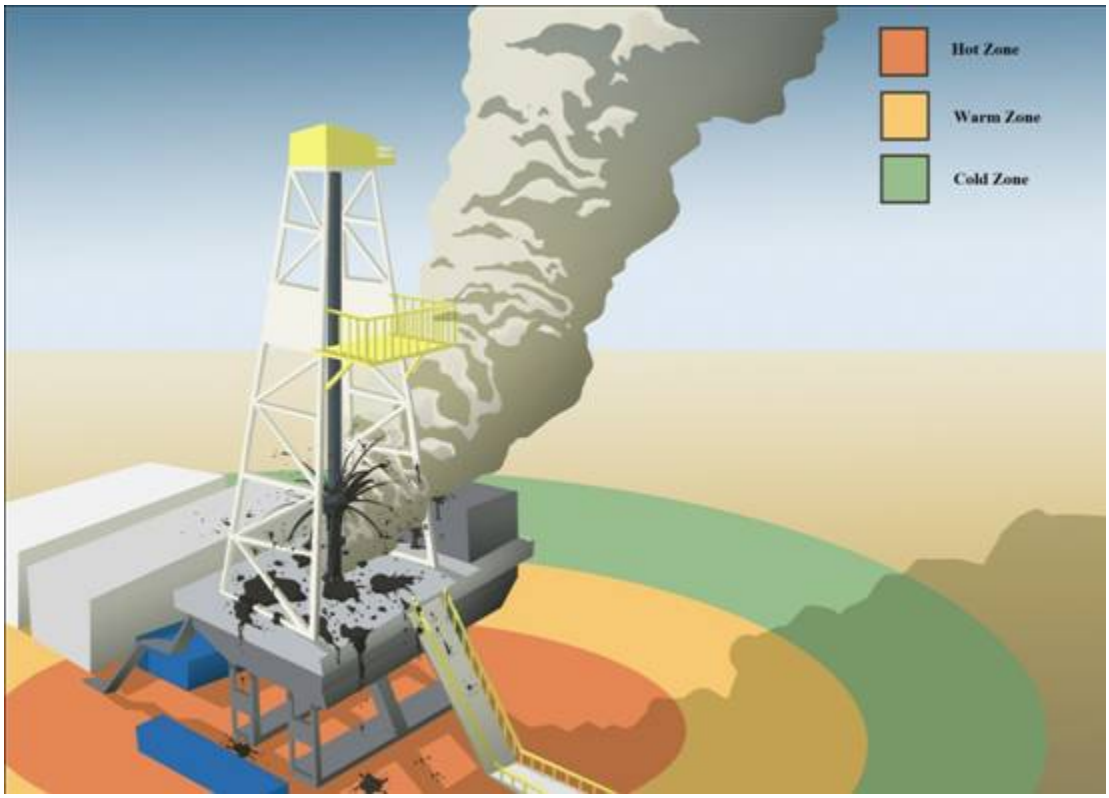
1. A 'SITE SAFETY PLAN' is required before wellsite work can start. This plan is developed and implemented by the On-Scene Commander after initial evacuation of personnel.
2. For non-burning blowouts, the 'Hot Zone' boundary must be realistically based on presence or the anticipated presence of an explosive mixture (LEL levels), rain of hydrocarbons, H_2S and/or explosive and violent materials, and is principally controlled by wind direction but is influenced by the leak rate and location as well as the direction of the flow.
3. On burning blowouts the 'Hot Zone' will likely be set on radiant heat limits and smoke avoidance, and the presence of any explosive and violent materials. Wind direction also has considerable impact in 'Hot Zone' boundaries. Some fires do not burn clean and product can exist in the presence of a fire, therefore item 2 and 3 must be considered together.
4. Generally the 'Hot Zone' will be set by inspection and not from a quantitative analysis. This will be revised as time goes on and the will be monitored carefully throughout the project.

5. If the 'Hot Zone' boundary is set by actual measurements, it will be done by two men with SCBA's. They will approach blowout using LEL meter, H_2S meter, dB meter and Radiant Heat Meter (if available) and check levels downwind of the well area. Initial approach should be from an upwind direction.
6. The boundary of the 'Hot Zone' is defined as when first indication is seen of either:
    a. >1/2 LEL level (2% concentration of hydrocarbons in air) at any near surface elevation.
    b. Surface pooling or streaming of liquid hydrocarbons, surface gas bubbling or hydrocarbon and water vapor fogs (restricted visibility and explosive vapor).
    c. >10 ppm H_2S.
    d. >85 dB noise level.
    e. Over 3 KW/m2 heat loading or practically the point where exposed skin cannot sustain exposure without protection from more than a few minutes.
7. When measuring parameters, approach problem well from any possible access route (including those located downwind) and repeat this process.
8. Where possible, set 'Hot Zone' boundaries away from these hard indicators (ex. ¼ LEL) at good control points.

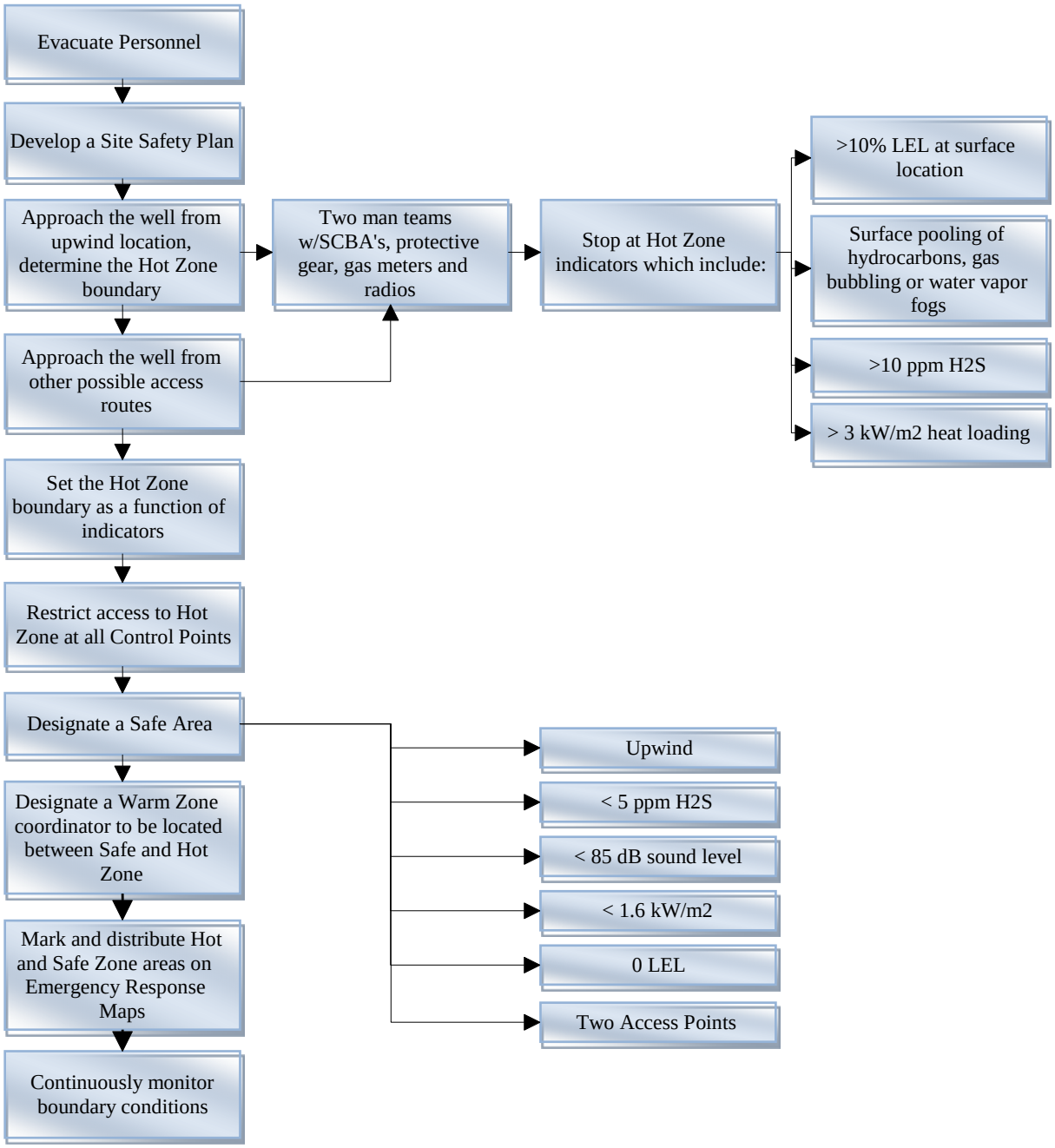
    'Hot Zone' shall be restricted to well control experts or designee of the On-Scene Commander and shall be allowed in the zone on a permit only basis and only for a prescribed and defined task. The 'buddy' system will be maintained at all times and cover of water provided for each when appropriate.

9. Manpower with radios from rig crew, safety and production department can be used at these defined 'Hot Zone' control points to restrict access into the 'Hot Zone'. Downwind 'Hot Zone' boundary must be tightly controlled and continuously monitored as variable winds can quickly change the boundary. Some access routes should be blocked to prevent accidental entry.
10. The 'Safe Area' or 'Cold Zone' location is based on the 'measurable' 'Hot Zone' boundaries, available work areas and access and wind direction.
11. The safe distance seen in the downwind approach of the 'Hot Zone' boundary is then used as one guideline for setting the 'Safe Area'. Additionally, dispersion modeling can be used with the measurements taken to help predict downwind conditions.
12. Access to areas inside the 'Hot Zone' must only be from the 'Safe Area'. Other alternate paths into the 'Hot Zone' are blocked.
13. 'Safe Area' should be accessible from two directions.
14. 'Safe Area' restricted to essential personnel with proper protective equipment.

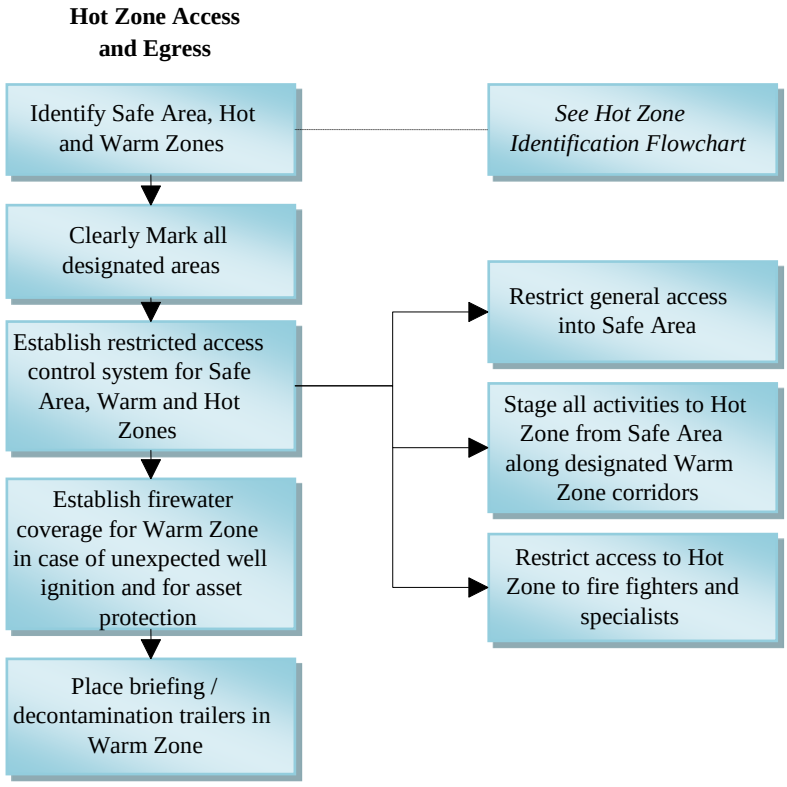
15. 'Safe Area' should be in area with 0 LEL, <5 ppm H_2S, <85 dB sound level and, 1.6KW/m2 heat loading.
16. Mark the designated 'Hot Zone' and 'Safe Area' on the available Emergency Response Maps for distribution and all procedures for areas.
17. As the well and wind conditions change, the 'Hot Zone' boundaries will shift. The 'Safe Area' could also be moved. An example would be shifting boundaries after well ignition.
18. The 'Warm Zone' is the route between the 'Safe Area' and the 'Hot Zone'. Control indicators (LEL levels, H_2S, radiant heat, etc.) are continuously monitored within the 'Warm Zones' at the entrance to the 'Hot Zone'.
19. The 'Warm Zone' is restricted to essential support personnel only.



D.3 Hot Zone Identification Flow Chart



D.4 Hot Zones Access and Egress Flowchart



D.5 Heat, Noise and Explosion Hazards

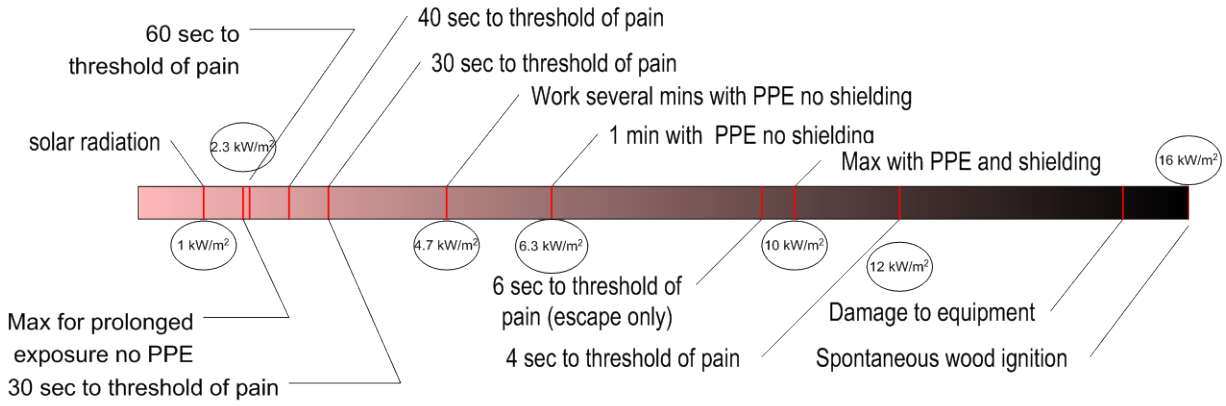
D.5.1 Heat Radiation

Intense heat is generated by a burning well which is a serious health hazard to personnel and risk to equipment working near the fire. Heat radiation is dependent upon the dosage received, which is a calculation of intensity of the heat and exposure time. Heat radiation intensity is usually expressed in kW/m^2 (where 1 kW/m^2=317 $btu/hr/ft^2$) and is measured with a radiometer. The effects of excessive heat radiation to a human are identified by first pain, then the skin blisters and burns. Burns are classified as first degree up to third degree burns which can cause death.

Levels of heat radiation and its effects are shown in the table below and graphically illustrated below.

Radiation Intensity		Remarks
kW/m^2	**Btu/hr/ft^2**	
0.79-1.04	330	Solar radiation.
1.58	501	Maximum level that personnel can stand for prolonged times with no protection.
1.74	552	60 seconds to the threshold of pain.
2.33	739	40 seconds to the threshold of pain.
2.9	919	30 seconds to the threshold of pain.
4.73	1500	Several minutes without shielding with PPE clothing.
6.31	2000	One minute without shielding with PPE clothing.
9.46	3000	6 seconds to the threshold of pain. Exposure limited to a few seconds only.
10	3170	Maximum level with protective equipment.
11.67	3700	4 seconds to the threshold of pain.
15	4755	Equipment becomes damaged.
16	5072	Spontaneous ignition of wood.

Note: Burns result quickly after pain threshold.



Oil fire burns at approximately 2200^o C (4000^o F) and a gas fire at 3310^o C (6000^o F)

API 521 Guide for Pressure-Relieving and Depressurizing Systems provides the following information on tolerable heat radiation exposure to personnel.

- 6.3 kW/m^2 is heat intensity level in areas where emergency actions lasting up to 1 minute may be required by personnel without shielding with appropriate clothing.
- 4.7 kW/m^2 is the heat intensity level in areas where emergency actions lasting several minutes may be required by personnel without shielding with appropriate clothing.
- 1.6 kW/m^2 is the heat intensity level where personnel without protective clothing can be continuously exposed.

The above example should be used as a guide for contingency planning purposes. A new analysis with more accurate data may be useful. In actual emergencies, heat radiation levels will have to be judged according to conditions prevailing at the time. The situation is dynamic and will alter with changes in wind direction and speed. Therefore a place that was safe could become unsafe.

Even light clothing increases exposure levels by 10 fold over bare skin. Additionally, one can use a water curtain and sprays for heat protection. A reflective shield between the worker and the fire (e.g., corrugated metal sheeting) is essential. Aluminized heat protection suit is suitable protection up to 15 kW/m^2. Near proximity to the fire is extremely dangerous and should only be entered by well-trained and experienced people who are physically and mentally fit.

D.5.2 Noise Hazards

Loud noises can damage hearing, which is commonly referred to as noise induced hearing loss. This loss of hearing can be temporary or permanent, depending on the exposure. The effects vary with the level and duration of the exposure. In a blowout, which lasts for a limited time, hearing impairments are likely to be temporary. The graphic below shows level of noise that can be tolerated.

45 dBA	85 dBA	115 dBA	135 dBA
Limit for Sleeping inside quarters.	Upper limit without protection for 8 hours exposure.	Short duration (15 minutes) without protection.	Upper limit short time with or without protection.

D.5.3 Hazards from Explosive/Flammable Atmospheres

Hydrocarbon gas when mixed with air form explosive mixtures in the range of approximately 5% by volume (lower explosive/flammable limit- LEL/LFL) to 15% by volume (upper explosive/flammable limit- UEL/UFL). The table below show various mixtures, LEL/LFL% for various rates of release. The model uses wind speed, volume released and atmospheric conditions to determine the mixture.

Moderate Pressure - Natural Gas

Distance to Endpoint (ft)

Horizontal Release	LFL	1/2 LFL	1/10 LFL
25 MMSCF/D	240	465	1130
50 MMSCF/D	250	480	1260
100 MMSCF/D	260	500	1475
200 MMSCF/D	280	540	1675
300 MMSCF/D	290	570	1860

Vertical Release	LFL	1/2 LFL	1/10 LFL
25 MMSCF/D	25	100	575
50 MMSCF/D	25	100	650
100 MMSCF/D	30	105	680
200 MMSCF/D	35	115	750
300 MMSCF/D	40	125	785

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Appendix E Incident Response

Contents

E.1 Response

Note: The contractor Evacuation Plan should be a good guide to evacuation in a blowout. However, it should be studied, posted, trained, drilled and if necessary, modified by Halcón Resources EHS and operations through bridging documents.

E.2 Initial Planning and Response Cycle Guidelines

The specifics of an acceptable response to a blowout incident are dependent on many factors making detailed response procedures for all incidents impractical. Despite the fact that any blowout situation is unique, a common systematic methodology to respond to and manage the control of the project can be made. The project cycle involves three overlapping phases, see Figure 5-1 and Figure 5-2.

The **Initial Response Cycle** (IRC) is the period from initial notification until the blowout control team is formed and the Initial Planning Cycle starts. This phase is generally reactive and does not allow time for iterative planning. These initial response actions must be pre-planned and drilled (trained) to be effective.

The **Initial Planning Cycle** (IPC) is the period where the problems and initial tactics are defined and the first iteration of a strategic General Plan to regain control of the well is established. The General Plan describes the activities engaged and the resources required to achieve defined sequential milestones through to the completion of blowout control operations. This cycle is the most critical of the phases as it lays out the strategic objectives for the rest of the project and allows rapid transition from reactive to proactive project management.

The IPC follows a structured sequential format with specific activities, objectives, meetings and work products associated with each.

The **Daily Planning Cycle** (DPC) outlines the daily flow of events after the IPC is complete. During this phase, the initial response turns into a managed project with a routine, daily planning and operations cycle which will be followed until the completion of the blowout control project (much like drilling and exploration well). The system is still highly structured to continuously demonstrate safety and command and control. Concurrently, it provides the flexibility of command needed to adjust to the dynamic nature of a well control operations (e.g., if the situation changes the tactics and strategy may need to change with it).

Figure 5-1 Level III Response

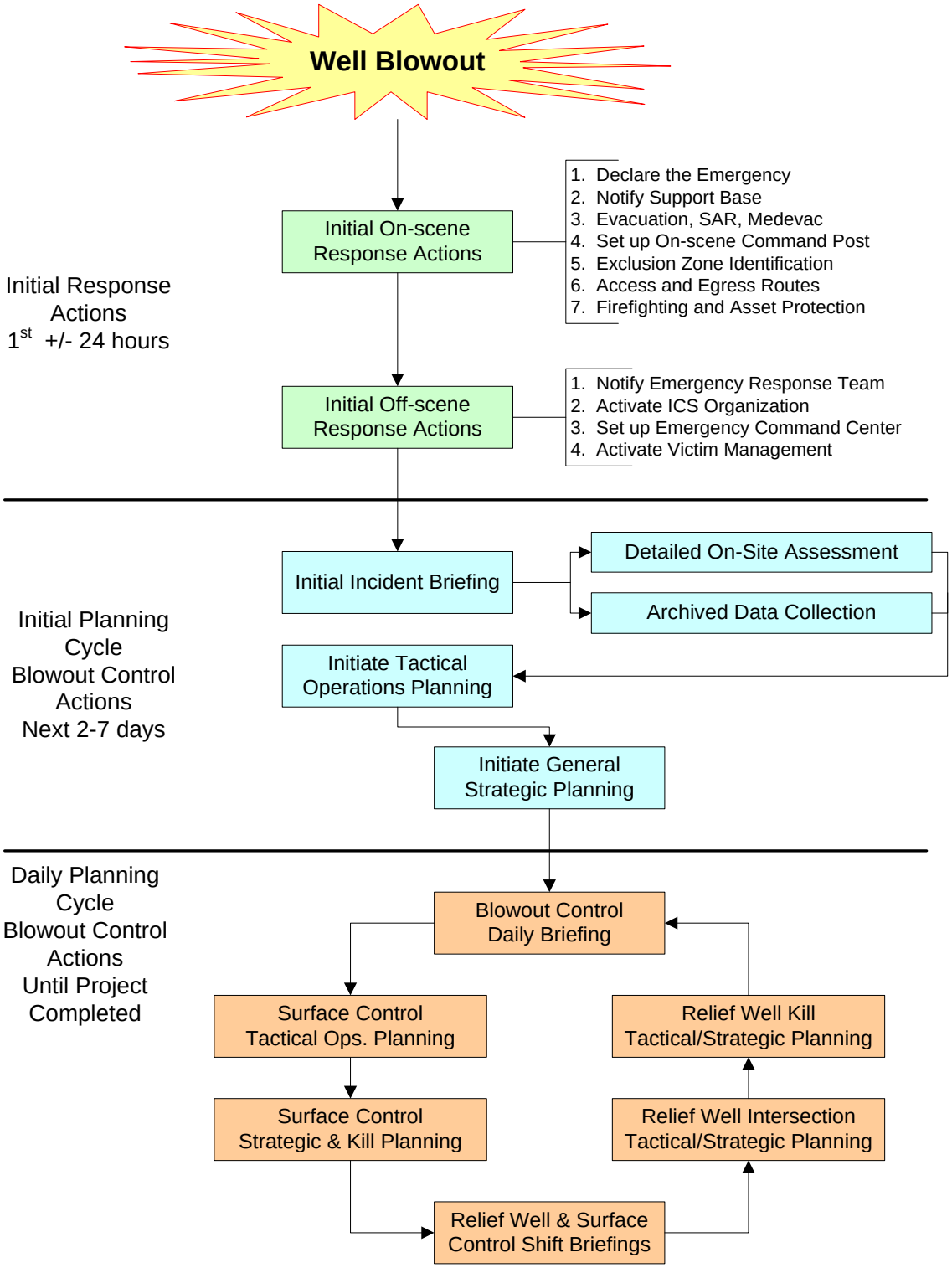
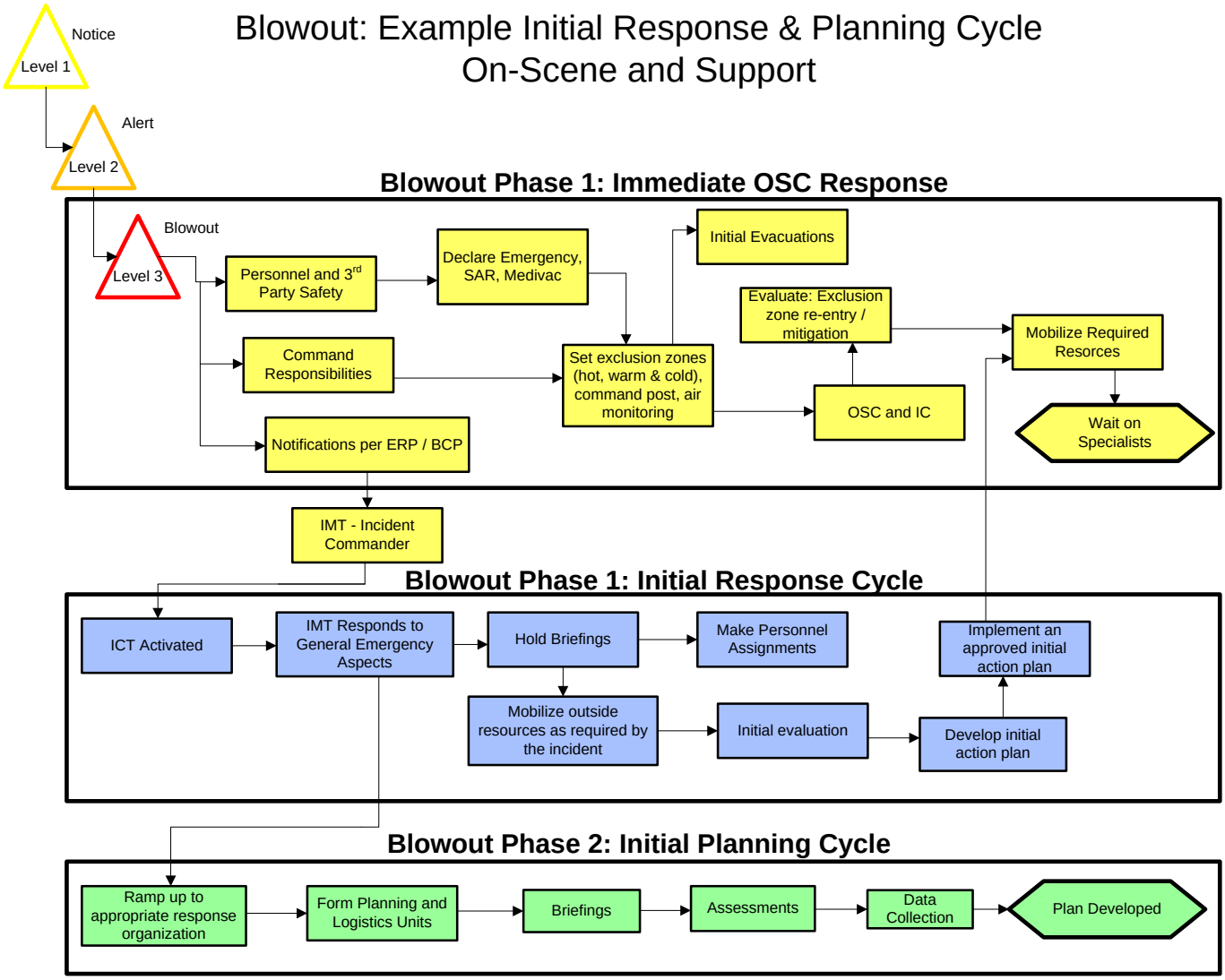


Figure 5-2 Level III Response



E.3 Environmental Release

Refer to the Halcón Resources 'Environmental Spill Contingency Plan' in the ERP.

E.4 Logistics

In a major Level III Incident, logistics will be an enormous undertaking. Close communication and constant interaction between TRT and IMT and the Logistics Sections of each are crucial in timely providing needed equipment, services, and material (See Logistics Chapter).

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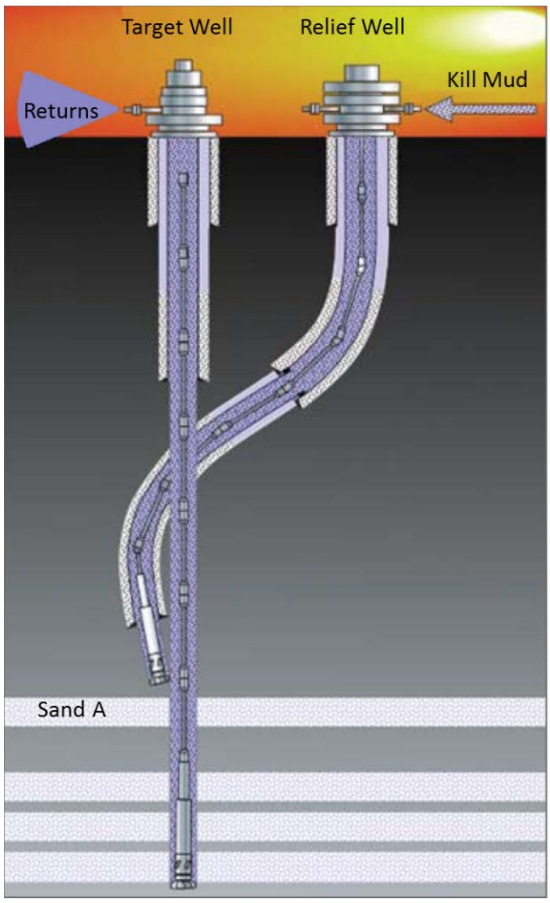
Appendix F Relief Well Considerations

Contents

F.1 Introduction - Relief Well Intervention



Implementation of a relief well as a well control technique basically involves establishing direct communication with the problem well by directionally drilling a hole to a specific down hole location in very close proximity to the problem well and at a depth sufficient that will allow overcoming the blowout flow. The interception of the well bore should be adequate enough to communicate with the blowout flow of the problem well. This would be considered a direct interception allowing a more effective control of the blowout flow. Alternatively, the relief well can be designed to communicate to the blowing reservoir with intentions to alter the reservoir properties with a matrix flood using water or polymers. Regardless of the objective, the relief well must make a close pass or interception of the blowing well to be successful. If possible and as a precaution, the interception should be planned and positioned to intercept within the plane of the maximum principal stresses of the formation rock. This will improve the chances to effectively communicate with the blowing well via the matrix or an induced hydraulic fracture when direct interception fails. When a proper communications is established, it should be possible to pump kill fluid at designated rates to kill the well.

F.2 Kill Techniques Review

In attempting to classify kill techniques, it is convenient to consider those which can be implemented directly over the blowing well or direct kills, and those that require the drilling of one or several relief wells.

Blowout control methods include some ‘pumping’, whether directly through the top of the blowing well or at depth via a relief well. The four basic pumping techniques that blowout ‘specialist’ usually refer to are:

- Overbalance kill
- Dynamic kill
- Momentum kill
- Matrix kill or flood kill

The best practice, once it is obvious that a 'simple kill' of the hydrostatic nature for instance will be ineffectual, is to prepare and spud a relief well concurrently with eventual surface kill preparations. If the surface kill fails, much time will have been gained.

The situation of the blowout will determine the type of kill required and the number of relief wells to consider. Once this has been established, quantity estimates and availability of the following can be made:

- Personnel
- Equipment
- Supplies
- Services

When making these estimates, the tendency is to look only to the worst possible case. While this is advisable in a contingency plan, a moderate or most likely scenario should also be investigated. Having alternative plans other that the worst case even will help eliminate 'overkill' and waste and allow the operator to move quickly in response to the emergency.

The further the surface location of the relief well is from drilled well, and the greater the depth to the intercept target, the greater the degree of precision required in directional control. The depth of the blowout has a major effect on how the well is killed. If relatively shallow, less than 3000 ft, it will require a shallow kick-off depth which can complicate directional control. The softer gumbo-type clays encountered while trying to obtain the high build and drop rates and high drift angles necessary just add to the directional control problems. Later under reaming or hole opening operations are also more difficult in such soft and often unconsolidated formations.

As the point of intersection becomes deeper, drilling times increase. However, the longer drilling time will allow orderly planning and mobilization of special equipment, supplies, and kill personnel. On the other hand, the deeper horizons are typically at a higher pressure and, up to a point, more prolific. The special equipment must therefore be sized upwards to meet the higher pressure and volume requirements. The deeper horizons and added drilling depths impact negatively on navigation as the ellipse of uncertainty increases. It might require many passes and re-drills before the blowing well is cleanly intercepted.

The planned trajectory is merely a general guideline and not an absolute rule. The relief well is drilled in three major phases:

- Phase I: Drill directionally to a point in space that converges near the blowing well's casing or BHA, within range of wireline proximity logs.
- Phase II: Locate the relative position of the relief well to the blowing well using proximity logging techniques and sound judgment.
- Phase III: Converge with the blowout well at the desired interception point, or a very close pass by, to establish the necessary communication to the kill the flow.

In reality, the plan for the well can only take the relief well to the start of Phase II. After the well is located using proximity techniques, the final trajectory design will take place.

F.3 Positioning the Relief Well

Positioning the relief well involves a number of objectives and subjective considerations. Listed below are the general factors taken into account while positioning relief wells for a typical exploration well:

a) Direction of the prevailing winds as defined by the regional met-ocean data
b) Safety perimeter around the well surface location is 350 m ± 10m based on a minimum pollution levels at the surface location and heat radiation of 120 mmscf/d gas fire
c) The blowout's targeted bottom hole location and position uncertainty
d) The subsurface location of other wellbores
e) Minimizing the distance and time to drill the relief well
f) Natural characteristics which influence direction control
g) The desired approach angle and direction in converging to the target
h) Degree of confidence in achieving a trajectory to interception
i) The depth at which interception must occur
j) Range and ability of proximity tools to detect casing or BHA, 60 meters for induction tools/50 meters passive magnetic
k) Maintaining as simple as possible trajectory and minimum dogleg severity, upper acceptable dogleg for planning purposes has been 2.0 deg/100 ft or 9.667 deg/10 meters

Local regulatory rules, with influence from underwriters, can impact the positioning of the relief well. Considerations may include environmental factors not limited to the state of the winds including the current speed, direction, velocity, and frequency. The situation at the blowout site with regards to the size of plume, type of well effluent, fires, surface catering, and the state of the

BOPE will also factor in to the positioning of the relief well. There does not appear to be any minimum distance, except as dictated by specific conditions. Other factors relate to the well to be drilled, such as where the original well will be intercepted and the intercept trajectory. A site selected without due consideration of all relevant factors can result in increased difficulty and cost in reaching the desired objective. The location of the relief well for each blowout should be chosen based on its own merits.

More importantly, the relief drilling site and the relief well trajectory must not be compromised by any existing rig, wells, or well paths. It is difficult to conceive of a more extreme situation than a blowout at or near a producing rig, where numerous wells converge to the rig. The nearby wells interfere with ranging techniques and enhance the ellipse of uncertainty. These conditions might suggest that the blowing well be intersected as deep and as far away from the congested area as possible, even though the ellipse of uncertainty is greater. The rig scenario becomes more complex when multiple wells are blowing out, requiring multiple simultaneous relief well drilling operations.

The general factors listed establish the preferred relief well location for a typical exploration well. An S-shaped trajectory for the relief well will usually suffice. This is the absolute shortest drilling distance that meets the objectives of the relief well and the 350 meter exclusion zone criteria. It represents an aggressive drilling trajectory with directional control, but compared to a simple J-shape that will require multiple plug backs, it is considered to be the most direct and efficient of all the possibilities. For typical exploration well, a single relief location that is a sufficient distance from the well, but close enough that an aggressive drilling program is possible, is usually recommended. However, each case is unique.

F.4 Relief Well Target

In considering the relief well target, there are two distinct possibilities in the blowing well. The first is the drill string is on bottom and the other the drill string is out of the hole, or pulled up inside the casing shoe, as in the string hung off before shearing the drillpipe. It is essential that there be metal, casing or drill string, in the blowing well for all the types of proximity logs to function. If the target interception point is an open hole interval, the drill string must be across the target zone. If this is not the case, the target will be the deepest casing shoe. If the drill string is on bottom, the target can be where the blowing well penetrates the flowing reservoir. However, for planning purposes, the last casing shoe set is a target that is known to exist and therefore the most advantageous target as the primary initial target in Phase II. Should a blowout occur, the directional plan can be altered for deeper horizon targets when conditions justify such a change.

The Phase II objective will be converging to the blowing well at the estimated location of the deepest casing shoe. The relief well must be between 50 to 60 meters of horizontal distance from the blowout wellbore, and be approximately lined up within 7 to 10 degrees in combined inclination and azimuth when the end of Phase II is reached.

Phase II begins when calculations show that the relief wells has come within 50 to 60 meters of horizontal distance to the blowing well. Note that the proximity logs measure distance between the two wells in a plane perpendicular to the well to be ranged to, therefore high angle wells may need adjustment of these criteria. At the depth of interest, the trajectory of the target wells in this plan is vertical or near vertical. Thus, the horizontal distance of 50-6- meters is valid without adjustment for inclination.

The first proximity survey can be made at the 50 to meter range. However, one should not expect to receive definitive information until the distance between wells is 15 to 30 meters, and the most reliable information becomes available in the 1 to 15 meter range. Course corrections should not be made unless data for proximity logs is in the 10 to 20 meter range, and confidence in the data collected is high.

Phase III, drilling to interception, is the most critical stage of the relief well project. Once the blowing well trajectory is determined, a precise trajectory can be determined for an interception. Given that confidence in the ranging data is attained, Phase III can begin.

The intercept point where the relief well and the flowing well are designed to come together is most usually at the bottom of the flowing well. This is normally where the flowing zone is found, except when serious pressure reversals exist. It is also the place where the kill fluid, when

placed in the flowing well, has the greatest influence due to its having access to the entire drilled wellbore. An off bottom kill would require a higher kill mud weight. However, bottom kill is not always the best approach. Lessons learned from the past tell us that in high permeability reservoirs (8 darcies, Ixtoc 1, June 1979) a bottom kill will never work.

The ellipse of uncertainty increases with depth so that more passes might be required before the flowing well can be hit with certainty. The deeper the well, the longer the drilling time. Temperature also increases with depth, so mud treatment becomes more complex. Ranging surveys and logging services also require more sophisticated methods at elevated temperatures. These effects, individually and collectively, increase operational cost. However, if the blowout well has several zones flowing, it might be necessary to consider a bottom kill and an off bottom kill.

Once communication has been established, the objective shifts to pumping a sufficient volume of kill fluid into the blowing well, at an adequate rate to overcome and kill the hydrocarbon flow from the producing interval. Once control is achieved during the initial kill operation, both wells need to remain stable until abandonment or work-over operations can take place. In no case should the kill operation expose the well to additional risk of unmanageable problems brought on by a worsening control situation. Reasonable judgment and practices should be taken in pursuing the kill operation. The kill should not be irreversible, nor should it unduly eliminate reasonable kill alternatives if the initial attempts fail. An example of an irreversible operation would be attempting to kill the well with cement rather than drilling mud. The overall plan should take this philosophy into account.

There is a remote possibility that in spite of best efforts, the relief well will miss the blowing well and make a close pass, perhaps 1 to 2 meters away. If a direct communication is not possible, it may be necessary to plug back to intercept. Depending upon the distance between wellbores, an acid job in carbonate rock may be considered to establish communication. This will work best if the relief well bore is in the pressure draw-down of the deepest producing zone. If this is the case, then an acid will travel naturally through the matrix of the producing zone and into the blowing wellbore. A work hole path will be created and the net result will be the creation of a direct communication between the wellbores. This option should be carefully studied before implementation as there are many acid treatment designs using gels, retarders and concentrations to consider. Direct communication established through interception is better than relying on an acid job to create a worm hole. Fracturing the rock matrix should be avoided, but if fracturing is to the attempted, then rock stresses will dictate the direction of the fracture path. If the intercept is not in the plane of the maximum rock stresses then the fracture will never intercept the blowing wellbore. Other options are perforating or milling techniques, if communication is to be a cased hole.

F.5 Casing Design and Seat Selection

The relief well casing design and seat selection must meet both the requirements of the kill operation and the normal regional drilling conditions. The ultimate objective of the relief well is to overcome and kill the flowing well. The conditions imposed by this objective are additional requirements beyond the normal casing design.

Casing strings should be designed against the following conditions:

Regulatory agencies may set the minimum-design conditions they expect to see in wells drilled in their jurisdiction, relating to whether or not the well must contain the full pressure at the surface, the safety factor for collapse, and so forth. Typically, they will dictate the maximum setting depth for the surface string to protect any ground water supplies.

Pressure during kick operations such as shutting in the well, circulating out the kick, or the pressure that could build if the pipe is sheared.

However, additional factors might need to be taken into account as the direct result of the blowout. If too little casing is set, there is the real problem of loss of circulation or worse, or even stuck pipe if differential pressures become extreme. If too much casing is set, you can run out of hole as the resultant hole size becomes too small to handle the large kill flow rates required:

- What is the impact on well design by the reservoir?
- Will the casing be of sufficient capacity to allow the high volume pumping required for the kill operation?
- Will the casing design allow for a back-up string in the event an additional string is required?
- Are any shallow zones pressure charged? Is the reservoir expected to be depleted in the vicinity of the wellbore?

These unique conditions that occur in the relief well are not common to ordinary wells. In an Underground Blowout, for example, there can be charging of upper formations or depletion of deeper formations. This may significantly alter previously observed conditions and present new problems during the drilling process. Additional factors have been considered and evaluated in addressing the relief well design:

- Effects of well casing configuration on the friction and flow rates required during the kill operation.

- Implications of setting an additional casing string to combat down hole problems encountered during drilling, i.e., can the objective still be attained if a further reduction in hole size is required or additional strings set?
- Realistic possibility of individual zones being artificially pressured or depleted and there is information to support this position.
- Use of the relief well as a replacement for the blowing well.

Besides the above, certain questions should be reviewed before spudding the relief well, to take advantage of the most current information:

- Has the target location changed significantly since the relief well plan was developed:
- Were there complications encountered in the original blowing well during the up hole sections which could threaten the success of the relief well? How will these be averted?
- Will the casing schedule have to be modified to meet the directional drilling objectives required to intercept the blowing well?
- Was there an unanticipated presence of a corrosive or toxic fluid such as CO_2 or H_2S requiring special considerations?
- Will the relief well be used as a replacement for the blowing well, and will this affect the casing depth?

If the relief well is to be considered as a replacement well for the blowing well then future requirements for production and stimulation must also be taken into consideration in the overall design. These details have not been covered by this study because it is thought that stimulation or productive casing loads are not to be applied to a relief well casing string. In other words, the relief well is thought of as a sole purpose well and not a producing well. The casings are detailed for a typical developmental and explorations well have been reviewed, and are adequate for a relief well loadings and conditions. Open hole and casing loads imposed by the kill operation have also been considered.

F.6 Ellipsoid of Uncertainty

The primary objective is to intersect the blowing well at some predetermined subsurface point, in this case the top of the producing formation. It must be realized that various factors detract from the ability to reach that point with pin point accuracy. The influence of the various factors is frequently described as the ‘cone of uncertainty’. Normal directional well targets are usually a two dimensional circle or rectangle in the horizontal projection. The relief well must view the producing well’s trajectory in a three dimensional perspective. Consideration is given to

possible inaccuracies in, or lack of, survey data. As a result, rather than having a specific point for the target for the relief well, it becomes in reality an ellipse which is commonly referred to as the 'ellipsoid of uncertainty'.

While some would argue that an ellipsoid applies only to outdated directional survey tools, such as the single shot or multi-shot, it is still considered a standard to think of wellbore uncertainty as an ellipsoidal shape. High accuracy tools, such as North seeking gyro, have equal accuracy in azimuth as they do in inclination, and therefore the ellipsoid would truly be a sphere.

The factors which influence the relationship of uncertainty in a relief well situation can be summarized as:

- Accuracy of the survey on the surface location, 2 meters
- Type of directional survey equipment employed and their inherent inaccuracies
- Ability to confirm the well trajectory using different methods of measurement

The following criteria are a guideline for the preparation of this relief well contingency plan:

- Initial spotting of the rig on the relief well location must be accurate to within 5 meters of the desired position. Surveys must be recalculated through interactive measurements until the accuracy is within 2 meters by the time the kickoff point is reached.
- Three types of survey tools will be used, the MWD, EMS and the North Seeking Gyro. Although not a directional tool the proximity tools will influence the degree of uncertainty. The tools will be supplied by the local directional or surveying vendors.
- The use of the three types of survey equipment in both open and cased hole will serve to verify the accuracy and repeatability of the surveys. Proximity tools will determine the relative position of the wells to each other once the wellbores converge within the tool's range. Details on the survey program will be provided under the topic 'Directional Control'.

The reliability of a relief well plan depends not only on the ability to accurately measure the hole position, but also on the prescribed directional program. On paper, a wide variety of relief well trajectories are possible, but in practice only a few are practical. The selection of a relief well location and the planned trajectory go hand-in-hand. As discussed earlier, a great number of considerations are involved in the selection of the relief well location. The weighting of the various considerations relative to this plan has been biased by:

- Desire to minimize the necessary drilling time by picking a kickoff point as deep as possible and planning a trajectory which minimizes survey requirements, eliminates additional motor runs and doesn't automatically require plug back operations

- Avoidance of difficult directional maneuvers or approaches to minimize the possibility for failure
- Availability of reasonably accurate survey data on the blowout wells makes it sensible to plan a relief well trajectory with a fairly deep initial crossing point for wellbore location

F.7 Directional Control and Surveying Requirements

Maintaining a high degree of accuracy in the relief well directional control is essential for success. A successful relief well can be assured if stringent directional control is maintained:

- The relief well intersect of a blowing well is contingent on the ability to accurately map the blowing well's path from the surface to the bottom of the hole
- A consistent directional survey program is the key to this goal
- Inconsistencies in the directional data should be backed up by additional surveys' to resolve the differences

F.8 Surveying Requirements for the Relief Well

The relief well directional program will follow a trajectory from the selected surface location to a point in close proximity to the wellbore of the blowing well. At that point proximity tools will detect the casing in the target wellbore. Once the target wellbore is located, the existing blowout directional surveys are tied into the proximity tool's results to guide the relief well to interception.

Survey data obtained in the relief well should maintain a high degree of accuracy in order to reach the interception objective. The survey policy for a typical exploration well is adequate for the depth of the wells, considering the range of the proximity logs. Full-time use of MWDs should now commence. Run a North Seeking Gyro to confirm the location below the kickoff point in the relief well before running surface and protective casings. Use the same vendor's down hole survey tools as were used in the blowout well, in order to limit tool characteristic variables. Duplication of date accuracy between wells is best achieved if any variance in tool characteristics is minimized.

Avoid collision except at the point of interest. When the relief well comes into the vicinity of any wellbore, it may be necessary to run proximity tools to verify that a premature collision will not occur. Note: that Phase II of the drilling of the relief well begins when the calculated

distance between the wells is about 60 meters. Proximity logs are used to avoid any early collision. If a collision is eminent, course corrections may be required to guide the relief well safely past the wellbore to the intended target.

F.9 Converging to the Blowing Well

Provided the directional surveys for the blowing well are reasonably accurate, it should be possible for the relief well to drill directly to the vicinity of the deepest casing shoe or the BHA left in the blowing well. The convergence path of the relief well presented in this plan should have a combined difference in both azimuth and inclination of less than 10 degrees from that of the target well. If the target well is to achieve this path, the relative position of the relief well to target well must be established at considerable distance from the crossing point. The radius of uncertainty can create a situation where it is very unlikely that an interception could be achieved using directional techniques alone, e.g., drill to a point in space without ranging to the target.

In essence, the proximity tool reduces the ellipse of uncertainty. For relief well plans, there are two primary types of proximity tools. One delivers its ability to detect an adjacent well through an induced electrical field, while the other measures the magnetic flux between the tool and the casing or bottom hole assembly in the target well. Regardless of the tool used, metal in the BHA or casing of the relief well is required for these tools to work, or iron for the passive tool. If there is cased wellbore nearby, the interpretation can be difficult. Both proximity tools have unique sets of strengths and weaknesses so use both to take advantage of each tool's strengths.

F.10 Induction Tool

The induction tool makes use of an induced electromagnetic process which effectively, allows detection of a well within 50 to 90 feet. The inductive electromagnetic process requires the tools to be run in open hole. If the emitting electrode cannot be placed in open hole, the range is reduced to about 30 to 40 percent. For best results with the electric process range, the induction tool should be run in at least 100 meters of open hole. Open hole logging can be a major drawback if hole conditions are not optimal. A method used to overcome this problem has been to run open-ended drill pipe to just above the depth near the point of investigation. The tool is then run inside the drill pipe and allowed to exit into the open hole.

F.11 Passive Magnetic Surveys

The passive magnetic tool can detect casing at 150 feet. This process isn't strongly influenced by being run inside a non-magnetic drill collar, and is the preferred method of making the survey. The ability to run inside the string saves valuable rig time by eliminating trips. Although used to detect pipe at a distance of 150 feet, the accuracy of the passive tool is generally better within a 40 to 60 foot range of the target wellbore.

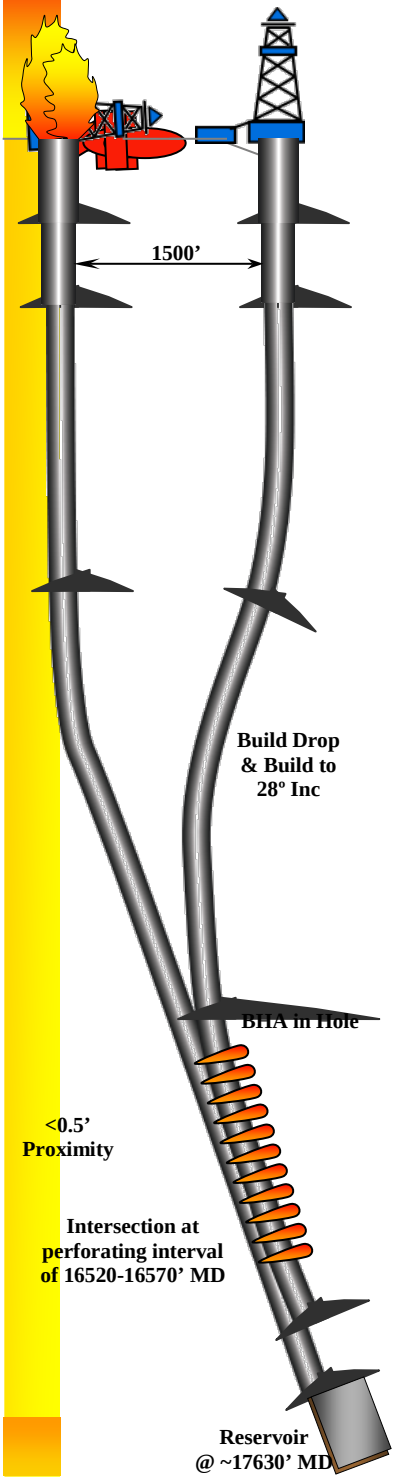
F.12 Intercepting and Establishing Communication

Under the conditions presented by a typical exploration well, direct interception of the blowing well in the open hole, at or below the top of the producing interval, should be the primary objective. If the well is cased, the objective will be to pass near the top perforation. The ideal point for the relief well to intercept the target well is at the top of the main reservoir, where kill weight fluid will be injected directly into the flow at its source. It is possible that a direct intercept cannot be accomplished, but adequate communication can be established between the wells. Since the reservoir is limestone, the communication can be through the rock matrix. Acid may be used to remove mud damage and open the permeability if required.

If the target well is not intercepted, and acid fails to open up a sufficient flow path, more drastic methods may be required to establish communication with the well. The options will vary depending on the individual situation, but may include such operations as fracturing between wells or perforating the formation with a tubing conveyed shaped charge, oriented toward the target wellbore.

Despite the means necessary to establish communication, all preparations to perform the kill operation must be in place before drilling the final segment of the relief well. If an intercept is attained, there will be no option but to immediately commence the kill operation.

Figure 1



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